NUCLEAR SCIENCE ABSTRACTS

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GENERAL

7058
THE RADIOACTIVE ELEMENTS. Je. Bresler. Berlin, Veb Verlag Technik, 1957. 346p. (In German)

The book The Radioactive Elements, translated from the original Russian, is intended primarily for the chemist. The radioactive decay series are discussed briefly. Then the enrichment and separation of radioactive material, the adsorption of radioactive material, the chemistry of the radioelements, short-lived radioactivity and nuclear reactions, the preparation of short-lived radioisotopes and their compounds, the most important radioisotopes such as tritium, radiocarbon, phosphorus, and sulfur, and finally marked atoms as research tools are all considered. (J.S.R.)

7059
STATUTE OF THE EUROPEAN NUCLEAR ENERGY AGENCY. CONVENTION ON THE ESTABLISHMENT OF A SECURITY CONTROL IN THE FIELD OF NUCLEAR ENERGY AND ANNEXED PROTOCOL ON THE TRIBUNAL ESTABLISHED BY THE SAID CONVENTION. CONVENTION ON THE CONSTITUTION OF THE EUROPEAN COMPANY FOR THE CHEMICAL PROCESSING OF IRRADIATED FUELS. Paris, Organisation for European Economic Co-Operation, 1957. 85p. (In French and English)

7060
INDUSTRIAL USE OF RADIO-ISOTOPES. Alan B. Lillie. pp. 167-99 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

A survey of the industrial uses of radioisotopes is presented under the general classifications of radiation affecting material, materials affecting radiation are such applications as thickness and density measurements, controlling equipment, and level controls and indicators. In the category of radiation affecting materials is found radiation batteries, elimination of fire hazards by elimination of static electricity, sterilization and preservation, and activation of chemical processes. In the third category radiation is applied to chemical analysis and tracer studies. (J.S.R.)

Atomic Power

7061 AEC-tr-3178
BIRTH OF ATOMIC AVIATION. (Rozhdeniye Atomnoy Aviatsii.) S. Kopalin. Translated from Krasnaya Zvezda, No. 232, p.4 (1956). 4p.

The possibilities of the application of nuclear energy to the powering of aircraft are discussed. A nuclear aircraft is described, and the design difficulties with respect to weight and personnel protection from radiation are discussed. (J.S.R.)

7062
NEW LITERATURE ON THE PEACEFUL UTILIZATION OF ATOMIC ENERGY. Atomnaya Energiya No. 2, 122-4 (1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3290).

7063
THE ARCHITECTURE OF NUCLEAR POWER STATIONS. Philip A. Dixon. G.E.C. Atomic Energy Rev. 1, 119-24 (1958) Mar.

Following a brief comment on the role of the architect in industrial building and civil engineering, the requirements for the location of a nuclear power station are outlined, and the general principles to be observed when designing such a station are discussed. The design of the major elements in the station is considered in some detail, with particular reference to the Hunterston project, but also for single-reactor, and foreign, stations. Brief mention is made of the materials to be used on the projects and the steps that are taken to ensure their satisfactory use. (auth)

7064
SURVEY ON THE APPLICATIONS OF ATOMIC ENERGY. Teresio Guglielmone. pp. 13-21 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The application of atomic energy to electric power production is discussed. The efforts of various nations to generate electricity by reactors are described. (J.S.R.)

7065
POTENTIAL APPLICATIONS OF ATOMIC POWER IN ENGINEERING AND INDUSTRY. Ulysses Staebler. pp. 105-14 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p.

The possible applications of nuclear power to the generation of electricity, to heating, and to propulsion and the use of radiation in industrial processes are reviewed. (J.S.R.)

7066
TECHNICAL CRITERIA FOR NUCLEAR LEGISLATION. Edoardo Amaldi. pp. 147-65 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The legislative measures in the United States, England, Canada, and France with respect to the control of geological surveys for and mining of fissionable materials, operation of laboratories and research reactors, and the power

reactor program are reviewed. The situation in Italy is compared with these countries. The necessity for additional legislation is investigated. (J.S.R.)

7067

THE ATOMIC ENERGY PROGRAMME OF THE UNITED KINGDOM. Compton A. Rennie. pp. 285-98 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p.

The atomic energy program of the United Kingdom for the next ten years is broadly outlined. The expanding industrial need for electricity and the increasing shortage of conventional fuels have led to the decision to build 12 nuclear power stations in the ten years to 1965. This initial program is regarded as the basis of a more rapid expansion in the use of nuclear power after that year. The problems still to be solved are briefly discussed. (J.S.R.)

BIOLOGY AND MEDICINE

7068 AEC-tr-3179

THE PROBLEM OF THROMBOCYTOSIS. G. M. Sokolova. Translated by V. N. Rimsky-Korsakoff from Klin. Med. (U.S.S.R.) 30, 76-8(1952). 6p.

7069 AEC-tr-3183

THE CHEMICAL NATURE OF THE TOXIN SECRETED BY A MALIGNANT TUMOR. A. M. Kuzin (Kusin) and I. A. Chudinova (Tchudinov). Translated by Lydia Venters from Doklady Akad. Nauk S.S.S.R. 107, 289-90(1956). 5p.

7070 AEC-tr-3186

EFFECT OF THE TUMOR EXTRACTS ON THE CATALASE AND COENZYME A OF THE LIVER OF NORMAL MICE. A. M. Kuzin (Kusin), K. S. Sharukhova (Sharouhov), and I. A. Chudinova (Tchudinov). Translated by Lydia Venters from Biokhimiya 20, 126-8(1955). 7p.

Tumorous tissue secretes substances into the blood which are able to lower catalase activity and CoA in the liver of the animals. Injected into healthy animals those substances are capable of showing a depressing action in regard to catalase and CoA. The substances in question pass through collodion membrane and, therefore, they have a low molecular weight. They are absorbed by anion exchange resin, and, presumably they have a basic character. (auth)

Radiation Effects

7071 AF-SAM-58-44

School of Aviation Medicine, Randolph AFB, Tex.

PRELIMINARY STUDY OF THE EFFECTS OF X-IRRADIATION ON THE ANTIBODY-COMBINING CAPACITY OF HUMAN PROTEINS. William G. Glenn and Iowa W. Marable. Nov. 1, 1957. 4p.

Lyophilized human plasma, immune globulin, serum albumin, and pooled normal human serum were exposed in vitro to x radiation up to 200,000 r. These antigens were then titrated with homologous rabbit antisera by the alpha procedure and the extent of reactivity measured by the photonreflectometric or light-scattering method. Only in irradiated serum albumin was any appreciable difference in affinity for homologous antibody observed. Such difference was apparently transitory. Serum agar analyses failed to confirm the observation of other workers that x radiation dimerizes protein. Except for serum albumin, highly concentrated human proteins, exposed to large doses of x radiation, undergo no change in antigenicity, as measured by affinity for homologous antibody. (auth)

7072

STEROL SYNTHESIS AFTER WHOLE BODY ROENTGEN IRRADIATION. III. EFFECTS OF SYNKAVIT. H. K. Hanel, G. Hjort, and P. R. Purser (Radium Centre, Copenhagen). Acta Radiol. 49, 141-4(1958) Feb.

The authors have shown that the tetrasodium salt of 2-methyl-1,4-naphthohydroquinone diphosphate (synkavit), in the concentration used, is radiomimetic in its effects on cholesterol synthesis from sodium acetate in mouse liver. Histologic examination of the liver cells shows changes in the nuclei and mitotic figures in a few of the cells. (auth)

7073

EFFECTS OF IRRADIATION OF TRYPSIN WITH X RAYS. Bernard Magnan de Bornier. Compt. rend. 246, 1081-4 (1958) Feb. 17. (In French)

Trypsin diluted in aqueous solution is inactivated by x rays, an indirect effect being responsible for the inactivation. Moreover, there is no exponential relation between the dosage received and the percentage of inactivation; this suggests the hypothesis that inactivated trypsin presents a greater affinity for the free radicals than the non-irradiated trypsin. (tr-auth)

7074

INDIRECT CHEMOTROPHIC ACTION OF γ RAYS ON THE BITTERLING (RHODEUS AMARUS B.). Erwin Heintz. Compt. rend. 246, 1309-12(1958) Feb. 24. (In French)

In a series of investigations on the action of different physical and chemical agents on the behavior of the bitterling, the effect of gamma radiation on these animals were studied. The fish were placed in a long glass tank. A section of the tank was irradiated, the other section was screened with lead. Under the influence of gamma rays, the center of gravity of the group of fish assumes an average fixed position 2 to 3 min after irradiation and the distance in centimeters which separates this position from the average position of the center of gravity in the absence of all radiation constitutes the measure of the effect (repulsion or attraction) of the dose of radiation used. In one series of experiments the ends of the tank were covered with filter paper and in another series the walls were made of depolarized glass. The results are tabulated. The effect of the filter paper was also determined. (J.S.R.)

7075

FURTHER EVIDENCE OF INDIRECT INDUCTION BY X-RADIATION OF LYMPHOCYTIC NEOPLASMS IN MICE. L. W. Law and Michael Potter (National Cancer Inst., Bethesda, Md.). J. Natl. Cancer Inst. 20, 489-93(1958) Mar.

Thymectomized and irradiated (C57BL × A)F_1 hybrid mice receiving thymic tissue from C57BL donors as late as 28 days after irradiation develop lymphocytic neoplasms. These neoplastic cells arising at the site of thymic grafts have been shown by their genetic histocompatibility response to be derived either from nonirradiated cells of the thymic graft (C57BL) or from cells of the irradiated host (C57BL × A)F_1 which repopulate the graft. Thus, cells of the lymphoid series that are eventually transformed to the neoplastic state need not receive direct radiation. A postradiation influence, which persists at least for 28 days in the (C57BL × A)F_1 mouse, has been detected. (auth)

7076

DIRECT REGISTRATION OF AN INSTANTANEOUS X-RAY EFFECT IN RATS AND MAN. R. Brinkman and H. B. Lamberts (Univ. of Groningen, Netherlands). Nature 181, 774-5(1958) Mar. 15.

7077
PROCESSING OF FOODS WITH IONIZING RADIATIONS. B. Coleby. Nature 181, 877-9(1958) Mar. 29.

7078
EFFECTS OF 5-HYDROXYTRYPTAMINE ON SOME ASPECTS OF HEMORRHAGIC STATE ON RADIATION-INDUCED THROMBOCYTOPENIA. I. Djerassi, E. Klein, Sidney Farber, and D. Palmer (Children's Medical Center and Harvard Medical School, Boston). Proc. Soc. Exptl. Biol. Med. 97, 552-4(1958) Mar.

Synthetic serotonin (5-hydroxytryptamine-creatinine sulfate) increased vascular resistance and shortened the duration of traumatic bleeding in irradiated thrombocytopenic guinea pigs and mice, respectively. These effects were of short duration and were observed only when large doses of serotonin were given rapidly. Transient pulmonary distress was associated with the administration of effective doses to guinea pigs. (auth)

7079
TOTAL LIPID, CHOLESTEROL, AND PHOSPHOLIPID CONTENT OF NON-IRRADIATED AND IRRADIATED SKIN. H. P. Schwarz, L. Dreisbach, and A. Kleschick (Philadelphia General Hospital). Proc. Soc. Exptl. Biol. Med. 97, 581-3(1958) Mar.

Data have been presented on total cholesterol, free cholesterol, phospholipid, and total lipid content of non-irradiated and x-ray irradiated skin of rabbits. Cholesterol of both non-irradiated or irradiated skin alike comprises mostly free cholesterol and only relatively small amounts, 9 to 13%, cholesteryl esters. Phospholipids of both non-radiated or irradiated skin consists of about 48 to 53% lecithin, 21% phosphatidyl ethanolamine, 11 to 12% phosphatidyl serine, rather small amounts of ethanolamine-plasmagens, and a relatively large amount, 18 to 21%, of unidentified phospholipids. Ionizing irradiation of the skin of rabbits has not significantly affected the lipids under study. (auth)

7080
BLOOD AND URINE TYROSINE LEVELS IN STARVED X-IRRADIATED RATS. A. J. Luzzio, G. Sutton, and J. G. Kereiakes (U. S. Army Medical Research Lab., Fort Knox, Ky.). Proc. Soc. Exptl. Biol. Med. 97, 593-5(1958) Mar.

Alterations in serum and urine tyrosine levels were observed in starved irradiated rats and in starved control rats. It appears that protein catabolism is somewhat slower following irradiation at the 800 r level we used. (auth)

7081
FAILURE OF PREGNANCY AS A PROTECTIVE AGENT AGAINST X-IRRADIATION. J. F. Spalding, V. G. Strang, and S. B. Hawkins (Los Alamos Scientific Lab., N. Mex.). Radiation Research 8, 222-6(1958) Mar.

7082
ALPHA-PARTICLE BOMBARDMENT OF THE HABROBRACON EGG. II. RESPONSE OF THE CYTOPLASM. R. C. Von Borstel and R. W. Rogers (Oak Ridge National Lab., Tenn. and Florida State Univ., Tallahassee). Radiation Research 8, 248-53(1958) Mar.

Alpha-radiation was used to kill newly laid Habrobracon eggs by inactivation of the cytoplasm. Cytoplasmic inactivation is kinetically and morphologically distinct from nuclear inactivation. The egg nucleus is inactivated by one α-particle; the 50% lethal dose is approximately 16×10^6 α-particles per egg when the cytoplasm is irradiated. Death occurs late in development when the cytoplasm is α-irradiated, and in most respects the morphology of the dead embryos resembles that from ultraviolet irradiation of the cytoplasm. (auth)

7083
EFFECT OF DAILY GAMMA-IRRADIATION ON THE PIGMENTATION OF MICE. Walter C. Quevedo, Jr. and Douglas Grahn (Argonne National Lab., Lemont, Ill.). Radiation Research 8, 254-64(1958) Mar.

7084
ELECTROPHORETIC STUDY OF PROTEINS FROM NORMAL AND IRRADIATED LENSES OF THE RABBIT. C. O. Rupe, R. W. Monsul, and Virgil L. Koenig (Northwestern Univ., Chicago). Radiation Research 8, 265-72(1958) Mar.

The normal rabbit lens contains approximately 28% proteins of which 95% is soluble and 5% insoluble in Veronal buffer at pH 8.6 with an ionic strength of 0.2. A series of electrophoretic studies of the soluble-protein fraction gives evidence of at least eight different proteins. In the development of x-ray-induced cataract the distribution of the protein components remains unchanged until after the cataract appears. Evidence is presented to show that components 1, 2, and 3 are the first to disappear from the soluble fraction. At the end of 195 days, components 6, 7, and 8 have disappeared, leaving small amounts of components 4 and 5. The amount of insoluble protein in the cataractous lens is not significantly different from that of the normal lens. On the other hand, the amount of soluble protein in the cataractous lens is significantly diminished. (auth)

7085
AN X-RAY SPERM-DOSE-ACTION CURVE FOR MUTATIONS AT A SINGLE LOCUS IN MORMONIELLA. Sarah B. Caspari (Univ. of Pennsylvania, Philadelphia). Radiation Research 8, 273-83(1958) Mar.

7086
THE ALKALINE PHOSPHATASE LEVEL OF THE PLASMA FOLLOWING RADIATION INJURY. Johannes Pany (Physiologischen Institut der Universität, Vienna). Strahlentherapie 104, 507-13(1957). (In German)

The author investigates the changes caused by x rays in the alkaline phosphatase of the blood plasma of rats. No effect having been detected after small doses, a heavier x ray load showed a dose dependence of the occurrence of ferment in the plasma (load of 500 and 1000 r). The probable origin of the ferment is discussed. (auth)

7087
THE INFLUENCE OF X-RAYS, SIMULTANEOUSLY AND PREVIOUSLY ADMINISTERED WITH O_2 PARTIAL PRESSURE, INVESTIGATED WITH RESPECT TO FRACTIONATION ON YOSHIDA LOCAL TUMORS OF RATS. Günther Grüssner (Der Stadtkrankenhauses, Kassel, Germany). Strahlentherapie 104, 514-23(1957). (In German)

7088
RADIATION DURATION AND TISSUE REACTIONS. Anton Kautzky. Strahlentherapie 104, 558-70(1957). (In German)

The tissue reactions, particularly the skin reactions, run in an autonomic rythm, which is characteristic of the individual and can only be influenced within certain limits by changing physical irradiation conditions. The first course of reaction is promptly followed by a second reaction if appropriate irradiation is applied. Irradiation beyond the first course of reaction without obtaining a second reaction leads to gradual waste. (auth)

7089
THE HOURLY REACTION OF THE WHITE BLOOD-PICTURE IN THE PROGRESS OF X-RADIATION SERIES. Eberhard Schaudig (Der Chirurgischen Universitatsklinik, Jena, Germany). Strahlentherapie 104, 571-80(1958). (In German)

While the irradiation series was in progress, the hourly reaction of the white blood picture was examined in 30

bronchial carcinoma patients. The changes occurred in the total number of leucocytes, in the number of eosinocytes, and in the white blood picture are reported, and the resulting values submitted to statistical analysis. (auth)

7090

EFFECT OF IONIZING RAYS ON THE VITAMINE ABSORPTION CAPACITY OF SERUM ALBUMINS. Adolf Morczek and Dietrich Mücke (Der Universität Leipzig). Strahlentherapie 105, 138-42(1958). (In German)

Freshly withdrawn serum was exposed to x ray doses of 50 to 500 kr. The change in contents of free biotin, riboflavin and niacin in the irradiated serum was then microbiologically examined. Because of their fundamentally consistent course, the resulting curves with various apices representing the free biocatalyst content, point to common mechanisms in the radiochemical behavior of protein-biocatalyst complexes. (auth)

7091

CONTRIBUTION TO THE GENERAL EFFECT OF IONIZING RAYS IN LOCAL THERAPEUTIC TREATMENT. Karl-Heinz Riessbeck (Dem Universitats-Institut fur Rontgenologie und der Geschwulstklinik der Charité Berlin). Strahlentherapie 105, 143-52(1958). (In German)

The present work contributes to clear up the problem of the general effect of ionizing rays in therapeutic local treatment. In connection with certain typical clinical pictures of irradiated carcinomas one can observe a characteristic behavior of the quantities of 17-ketosteroids excreted in the urine. The behavior of these products of hormonal decomposition does not reveal a direct dependence on the applied physical doses. The 17-ketosteroids reflect rather the biological conditions of the whole organism, especially as to the maximum charge of ionizing rays for further irradiations. Case histories are included as examples. (auth)

7092

ATOMIC ENERGY IN AGRICULTURE. William E. Dick. London, Butterworths Scientific Publications, 1957. 158p.

Applications of atomic energy in agriculture are discussed. These include the production of new and improved varieties of agricultural plants, the destruction and control of pests and diseases, tracing the path of carbon and other elements during plant metabolism, radioactive tracers in forestry, and applications of radiation for the sterilization and wholesale preservation of drugs and medicines and many food items. (C.H.)

Radiation Hazards and Protection

7093 TID-5360(Suppl.)

Division of Organization and Personnel. Safety and Fire Protection Branch, AEC.

A SUMMARY OF INCIDENTS INVOLVING RADIOACTIVE MATERIAL IN ATOMIC ENERGY ACTIVITIES, JANUARY–DECEMBER 1956. Daniel F. Hayes. Aug. 1957. 28p. $1.00(OTS).

Pertinent details of the incidents are given. Some are illustrated with photographs or diagrams. (M.H.R.)

7094 WT-1163

Food and Drug Administration, Washington, D. C. and Federal Civil Defense Administration, Battle Creek, Mich.

EFFECTS OF NUCLEAR EXPLOSIONS ON BULK FOOD STAPLES. Sumner C. Rowe. Mar. 1956. 38p. $0.30 (OTS).

Twenty-eight different selected packaged foods representing those of greatest volume in the American diet were exposed to nuclear detonations at the Nevada Test Site during the spring of 1955. The foods were divided into three groups: retail size packages, replicas of bulk packages, and bulk sizes (50 to 100 lb). The different packages were so placed that some were exposed to strong neutron and gamma flux, others to gamma radiation and blast effects, and still others to only blast effects. The foods were recovered as soon after exposure as feasible and were studied periodically for induced radioactivity, physical and chemical changes, organoleptic variations, nutritional adequacy, and toxicity. These studies showed that most foods were suitable for emergency feeding at presently suggested AEC tolerances within 15 days after exposure. The initial predominant radioactivity, in most cases, was demonstrated as resulting from sodium or potassium or both; the intermediate studies suggested phosphorus as the substance contributing the major portion of the radioactivity; and, in the final phase of the study, possibly the radiation effects on chlorine and trace elements predominated. Calculations were made of the levels of radioactivity and the half lives of the radioactive elements predominating in the foods. The organoleptic evaluations demonstrated an accelerated deterioration in the quality of the dairy products and an off-color development in the table salt. There was an indication of a change in the baking characteristics of the exposed flour and corn meal. Flying glass created a hazard in that some of the foods contained glass particles resulting from broken windows produced by the blast effect. There were no significant losses of vitamin content or change in protein quality of the foods exposed. Furthermore, there was no indication that the rate of deterioration of vitamins during storage was affected by exposure to radiation. The pharmacological tests have not been completed as yet, although apparently a synthetic diet consisting of the exposed and control foods did not affect growth after a 36-week study of rats. Nineteen elements that may occur in foods were exposed in the form of their chemically pure salts within the area of strong neutron flux to determine whether, and to what degree, the elements would become radioactive. The samples were examined for induced radioactivity over a period of three months. Tin, zinc, cobalt, silver, chlorine, phosphorus, and sulfur were found to be the elements of greatest significance since residual radioactivity could be demonstrated after considerable time. (auth)

7095 WT-1213

Food and Drug Administration, Washington, D. C. and Federal Civil Defense Administration, Battle Creek, Mich.

THE EFFECT OF NUCLEAR EXPLOSIONS ON COMMERCIALLY PACKAGED BEVERAGES. E. Rolland McConnell, George O. Sampson, and John M. Sharf. Mar. 1956. 18p. Project 32.2a [of] OPERATION TEAPOT. $0.20(OTS).

Representative commercially packaged beverages, such as soft drinks and beer, in glass bottles and metal cans were exposed to the radiation from nuclear explosions. Preliminary experimental results were obtained from test layouts exposed to a detonation of approximately nominal yield. Extensive test layouts were subsequently exposed during Operation Cue, of 50% greater than nominal yield, at varying distances from Ground Zero. These commerically packaged soft drinks and beer in glass bottles or metal cans survived the blast overpressures even as close as 1270 ft from Ground Zero, and at more remote distances, with most failures being caused by flying missiles, crushing by surrounding structures, or dislodgment from shelves. Induced radioactivity, subsequently measured on representative samples, was not great in either soft drinks or beer, even at the forward positions, and these beverages could be used as potable water sources for immediate emergency purposes as soon as the storage area is safe to enter after a nuclear

explosion. Although containers showed some induced radioactivity, none of this activity was transferred to the contents. Some flavor change was found in the beverages by taste panels, more in beer than in soft drinks, but was insufficient to detract from their potential usage as emergency supplies of potable water. (auth)

7096 WT-1214

Food and Drug Administration, Washington, D. C. and Federal Civil Defense Administration, Battle Creek, Mich.

THE EFFECT OF NUCLEAR EXPLOSIONS ON SEMIPERISHABLE FOODS AND FOOD PACKAGING. Robert E. Hardenburg and A. Lloyd Ryall. Feb. 1956. 59p. Project 32.4 [of] OPERATION TEAPOT. $0.40(OTS).

Semiperishable foods were exposed to two atomic shots of Operation Teapot. The yield of Shot I was approximately nominal (a nominal atomic bomb has an energy release equivalent to 20 kt of TNT). The yield of Shot II was approximately 50% greater than nominal. Ten types of semiperishable products (apples, oranges, potatoes, onions, raisins, dry beans, dry milk, cereals, flour, and candy) were exposed at distances of 0.25 mile to 2 miles from the blast. Foods were placed in trenches at approximately 1270 and 2750 ft and were covered with 1 to 2 in. of soil. At these locations foods were subjected to high initial radiation and blast overpressures. Foods also were placed on shelves in kitchens and basements of houses constructed at the test site at distances ranging from 4700 to 10,500 ft. At the close-in buried positions many types of food packages were partially crushed; some were broken, and their contents were contaminated with radioactive dirt. A high percentage of the apples, potatoes, onions, and oranges were severely crushed and bruised in the 1270-ft location, greatly reducing their possible food value in an emergency. As a result of the mechanical damage to the produce, decay during subsequent storage was much higher than in nonexposed produce. Many of the semiperishable foods recovered from the 1270- and 2750-ft trench positions were radioactive from the initial neutron bombardment. This was mostly induced radioactivity, rather than the surface type of contamination from fall-out. Most of this induced radioactivity decayed within 3 to 4 days, and food in intact packages could then be used, if needed, in an emergency. Dry milk, dry beans, raisins, and ready-mixed cake and biscuit flours were types of semiperishable staples which were found to have high levels of induced radioactivity. Potatoes showed higher levels of induced activity than onions, apples, or oranges. The initial radiation caused no visible effect on the foods or packages other than to cause a slight darkening of glass containers. However, potatoes exposed at 1270 and 2750 ft from the explosion failed to develop normal sprouts during subsequent storage. The high initial radiation from neutrons or gamma rays is assumed to have inhibited sprouting. The type of package, whether glass, tin, chipboard, or plastic film, appeared to have no protective effect on the extent of induced radioactivity of the contents. For example, rolled oats in a tin can or in a chipboard carton showed a similar amount of radioactivity, and raisins in aluminum-foil packages or in transparent film packages showed similar radioactivity. Food products in houses as close as 4700 ft were substantially free of induced radioactivity. No induced radioactivity was present in foods exposed in the houses at 5500, 7800, or 10,500 ft. Damage to foods in kitchens of houses at 4700, 5500, and 7800 ft was due principally to gross dislodgment from cupboards by the blast or from secondary missiles such as glass or wood splinters. The amount of bruising from the blast to perishable fruits and vegetables in these houses was negligible. There was no bursting of food packages at any exposure location. As expected, houses provided considerable protection from the blast for packaged foods. Most types of consumer packages withstood the physical shock of falling from cupboards to the floor. Chipboard cartons with film windows and cellophane bags were two types of containers that broke most frequently on falling. Generally, foods fared much better when stored on basement shelves than on kitchen shelves as far as blast damage from dislodgment was concerned. Foods did not fall from basement shelves even in houses where the above-ground portion of the house was destroyed. A basement food storage cabinet should be a relatively safe place for a family's emergency food supply. The flavor of a few products was damaged when exposed in the forward trench positions. The nonfat dry milk samples from the 1270-ft position had a very strong stale flavor and odor when reconstituted. This off-flavor was less intense in dry milk samples exposed at 2750 ft, but it was still objectionable. In general, the palatability of foods exposed to the atomic detonation in houses at 4700 ft and beyond was unaffected. (auth)

7097 WT-1216

Food and Drug Administration, Washington, D. C. and Federal Civil Defense Administration, Battle Creek, Mich.

THE EFFECT OF NUCLEAR EXPLOSIONS ON MEAT AND MEAT PRODUCTS. Robert H. Philbeck and Delbert M. Doty. Apr. 1956. 41p. Project 32.3 [of] OPERATION TEAPOT. $0.30(OTS).

Two general types of meats and meat food products were exposed to nuclear explosions. Processed types able to withstand slightly elevated temperatures, and consisting of Smithfield type hams, dried beef, sliced bacon, dry sausage, and lard, were exposed at current ambient temperatures. Fresh and cured chilled meats, consisting of beef rounds, pork loin, leg of lamb, veal ham, loin steaks, bologna, and frankfurters, were exposed under refrigeration maintained with dry ice. With respect to the first type types, exposure at 1100 ft from a shot of approximately nominal yield induced marked radioactivity in all products except the lard. This appeared to be due to the high salt content resulting from the curing operation. Odor, taste, and appearance were not adversely affected. There was evidence of destruction of riboflavin and of an effect on rancidity development. With respect to the second types, exposure at 1270 ft from a shot with a yield approximately 50% greater than nominal did induce radioactivity but at a lower level than in the high salt processed products. Visual and organoleptic evaluation of the perishable meats indicated that the exposed samples did not differ greatly from the unexposed in acceptability and nutritive quality. Some slight adverse effects were noted on texture and flavor. These appeared to be enhanced by cooking. (auth)

7098

THE USE OF $CaSO_4Mn$ FOR DOSIMETRY. B. M. Nosenko, L. S. Revzin, and V. Ya. Yaskolko (Central Asia State Univ.). Doklady Akad. Nauk S.S.S.R. No. 4, 3-4(1956). (Translated from Referat Zhur. Fiz. No. 2, 1957, abstract no. 3070).

It was established that flashing phosphor $CaSO_4(Mn)$ makes it possible to record doses from 0.005 to 40 roentgens; within these limits the reserve of the sunlight is proportional to the dose. The advantages of the above phosphor are insensitivity to invisible light and less tendency to hardness than Sr, Sm, and Eu; another advantage is the freedom from need for thermal glow. Its principal shortcoming is the great loss in sunlight with time. (auth)

7099

RELATIVE EFFECTS OF SPLENIC AND BONE-MARROW CELLS ON LETHALLY IRRADIATED MICE. Takashi

Makinodan, Nazareth Gengozian, and Isabel C. Shekarchi (Oak Ridge National Lab., Tenn.). J. Natl. Cancer Inst. 20, 591-600(1958) Mar.

Circulating antibodies were not detected among 950 r mice treated with isologous bone marrow and rat erythrocytes but were detected among 950 r mice treated with isologous spleen and rat erythrocytes. Over 95% of the mice exposed to 950 r survived when treated immediately after irradiation with isologous bone marrow or splenic cells. Only 39% of the normal mice exposed to 950 r died during the first 30 days after treatment, but 98% of a group of another strain exposed to 950 r died. In the latter group of treated mice, earlier deaths were recorded when the dose of splenic cells was larger. 42 references. (C.H.)

7100

GENETIC FACTORS INFLUENCING IRRADIATION PROTECTION BY BONE MARROW. II. THE HISTOCOMPATIBILITY-2 (H-2) LOCUS. Delta E. Uphoff and L. W. Law (National Cancer Inst., Bethesda, Md.). J. Natl. Cancer Inst. 20, 617-24(1958) Mar.

7101

PRECLUSION OF SECONDARY PHASE OF IRRADIATION SYNDROME BY INOCULATION OF FETAL HEMATOPOIETIC TISSUE FOLLOWING LETHAL TOTAL-BODY X IRRADIATION. Delta E. Uphoff (National Cancer Inst., Bethesda, Md.). J. Natl. Cancer Inst. 20, 625-32(1958) Mar.

7102

HAZARDS OF RADIOACTIVITY; THE FIFTH NATIONAL CONFERENCE ON PERSONNEL PROTECTION IN GOTTWALDOV. J. Fuska. Jaderna Energie 4, No. 1, 27 (1958) Jan. (In Czech.)

7103

CONCERNING THE ESTABLISHMENT OF SYSTEMS OF QUANTITIES AND UNITS IN RADIOLOGY. M. Oncescu. Metrol. Apl. 3, No. 3, 30-7(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3057).

A proposed systematization of radiological quantities and units is introduced. The radiological quantities are grouped into two ranks: the basic quantity is the dose in the first and the absorbed dose in the second. (auth)

7104

POSTIRRADIATION PARABIOSIS: INFLUENCE OF MYLERAN ON PROTECTION. Martin Schneider, William E. Watson, Carroll C. Jones, and John C. Finerty (Univ. of Texas, Galveston). Radiation Research 8, 227-33(1958) Mar.

7105

EFFECTS OF RADIUM IN MAN. William B. Looney (Univ. of Cambridge, Eng.). Science 127, 630-3(1958) Mar. 21.

7106

INVESTIGATION OF THE THERAPEUTIC POSSIBILITIES IN RADIOACTIVE CONTAMINATION. I. THE EFFECT OF CHELATING AGENTS ON THE BEHAVIOR OF RADIOCERIUM IN THE MAMMAL ORGANISM. Alexander Catsch and Du Khuong Lố (Heiligenberg-Instituts, Baden, Germany). Strahlentherapie 104, 494-506(1957). (In German)

Diethylenetriamine pentacetic acid and diaminodiethylether tetraacetic acid, when administered either early or delayed, increase to a much higher degree the excretion of radiocerium from the organism than ethylenediamine tetraacetic acid and other chelating agents. Highly effective are also condensed phosphates, however only if administered at an early stage. (auth)

7107

RADIATION INDUCED LEUKEMIA CONTRACTED BY AN ASSISTANT PRACTITIONER. Heinz Bohlig (Des Bezirkskrankenhauses, Meiningen, Germany). Strahlentherapie 104, 600-4(1957). (In German)

The case history is reported of a doctor's assistant who developed leukemia following absorption of about 400 r of x radiation over a 25-year period. (C.H.)

7108

THE HAZARD OF RADIOACTIVE CONTAMINATION BY THE USE OF Co^{60}. Julius K. Ries (Der I. Frauenklinik der Universität, Munich). Strahlentherapie 104, 605-8 (1957). (In German)

Investigations have proved that Co^{60} in the form of macrobalt as it is used nowadays, and with its present working equipment produces a concentration of radioactive cobalt through the plastic mass in the wood implements. This Co^{60} appearing mostly in dustlike particles provokes the great danger of radioactive contamination of the working rooms and endangers the personnel to get infected even through inhalation of the air. Macrobalt, therefore, should be used only with utmost caution and with the same protective measures which are prescribed for the use of open isotopes, as long as the proposals to abolish the dangers are not yet realized. (auth)

7109

GROUND RADIATION RECONNAISSANCE. V. P. Syrnev. Vestnik Vozdushnogo Flota No. 5, 52-62(1957).

The basic measures of anti-atomic defense are constant reconnaissance of ground radiation and a dosimetric checking of irradiation and contamination. Field and individual radiation detection instruments are described. (J.S.R.)

7110

BULLETIN OF THE ATMOSPHERIC RADIOACTIVITY. NUMBER 10 FOR JULY-SEPTEMBER, 1957. Tokyo, The Japan Meteorological Agency, 1958. 101p. (In English and Japanese)

Data are tabulated on the radioactivity of samples of rain water, airborne dusts, and air collected at various stations in Japan between July and September, 1957. (C.H.)

Radiotherapy

7111

INVESTIGATION OF VARIOUS RADIOACTIVE PHOSPHATE SUSPENSIONS AS TO THEIR THERAPEUTIC USE. Heinrich Kutzim (Der Hautklinik der Universität Cologne). Strahlentherapie 104, 551-7(1957). (In German)

The author examined numerous phosphate combinations as to their suitability for use in interstitial, intrapleural, and intraperitoneal therapy. Specially prepared chromium- and aluminum-phosphate suspensions proved singularly appropriate. Contrary to what happened in the case of the remaining combinations, these two were nearly insoluble in the animal organism and remained practically lying unchanged in the injected spot. They showed but a minimum move towards the organs. Even after injection into the venter cavity there was only a very reduced migration into the inner organs. (auth)

7112

OBSERVATIONS ON THE PROBLEMS OF I^{131} THERAPY OF CRANIAL METASTASES. Horst Waschulewski. Strahlentherapie 105, 66-72(1958). (In German)

After reporting two cases of cranial metastases posterior to operations of malign strumas and roentgen depth therapy, the authors explain their point of view with regard to the various problems of the radio-iodine therapy used on these patients. The treatment of radio-iodine-accumulating metastases of struma with radioactive iodine^{131} is prom-

ising remarkable palliative results; whether curative results will ever be obtained remains to be seen. (auth)

7113
THERAPY WITH P^{32} IN POLYCYTHEMIA. Horst Waschulewski and Ernst W. Dörffel (Der Univ.-Geschwulstklinik und dem Univ.-Röntgeninstitut der Charité, Berlin). Strahlentherapie 105, 87-90(1958). (In German)

Therapy with P^{32} is being used more and more in polycythemia vera rubra. There is no generally valid dosage scheme. Body-weight, blood-picture and general condition furnish certain clues. At present, we administer about 0.08 mc/kg body-weight as initial dose adding later, if necessary, further quantities under careful control of the blood-picture. (auth)

7114
OBSERVATION ON THE APPLICATION OF Cs^{137} IN THE INTRACAVITARY DISTANCE-CURIETHERAPY OF GYNECOLOGICAL CARCINOMAS. Friedrich Gauwerky (Allgemeinen Krankenhauses, St. Georg, Hamburg). Strahlentherapie 105, 107-18(1958). (In German)

The intracavitary distance-curietherapy with conscious handling of the spatial dose distribution by simple, variable use of heavy metal shield bodies offers a number of new methodic possibilities in the treatment of gynecological carcinomas if a radioactive substance with intermediate quanta energy of gamma-radiation in lieu of the presently generally employed hard gamma-rays is used. For this purpose, cesium 137/barium 137 has already stood its test in practical use. Adequate procedures of clinical use in carcinoma of the cervix, carcinoma of the vagina and some carcinomas of the rectum and the anus are described together with the applicators developed for this purpose. The author recommends the thorough use of these manifold possibilities in the clinical treatment of suited patients, and to see in them an enrichment of the equipment which makes it possible to adjust oneself more closely to the individual findings than with the traditional methods of radiotherapy. (auth)

Tracer Applications

7115
LOCATION AND DURATION OF RETENTION OF RADIOACTIVE PARTICLES IN MICE. Bo Holma and Arne Nelson (Research Inst. of National Defence, Sundbyberg, Sweden). Acta Radiol. 49, 145-53(1958) Feb.

A method is described by which the location and the duration of retention of inhaled particles were recorded under physiologic conditions by the exposure of mice to a radioactive aerosol, the mice being subsequently sacrified, sectioned, and autoradiographed. The distribution of the aerosol is discussed. (auth)

7116
THE GENETIC EFFECT OF INCORPORATED RADIOISOTOPES: THE TRANSMUTATION PROBLEM. Bernard S. Strauss (Syracuse Univ., N. Y.). Radiation Research 8, 234-47(1958) Mar.

7117
DIFFERENTIAL DIAGNOSIS OF THYROID AND PITUITARY SICKNESS THROUGH AN INCREASED RADIOIODINE TWO-PHASE STUDY. Wolfgang Horst and Heinz Heuwieser (Universitäts-Krankenhauses, Hamburg-Eppendorf). Strahlentherapie 105, 73-9(1958). (In German)

The diagnostic findings of the radioiodine two-phase uptake can be increased considerably by changing loads of thyroid hormone or thyrotropic pituitary hormone. The reciprocity between hypophysis and thyroid gland can be analyzed more accurately by this method. The determination of the so-called speed index allows further conclusion not only with regard to the thyrotropic, but also to the whole activity of the anterior lobe of the pituitary gland. (auth)

Waste Disposal

7118 CF-58-3-67
Oak Ridge National Lab., Tenn.
PROPOSED DEVELOPMENT PROGRAM FOR TREATMENT OF RADIOACTIVE WASTES FROM MERCHANT SHIP REACTORS. I. R. Higgins and W. J. Neill. Mar. 19, 1958. 6p. $1.80(ph OTS); $1.80(mf OTS).

A proposed development program is made for the treatment and disposal of radioactive wastes from Merchant Ship Reactors. Both ion exchange resin and filters are to be used for coolant system cleanup. The development program is concerned with methods of handling and packaging of the spent resin, filter cake and rare gases for safe disposal. (auth)

CHEMISTRY

7119 AERE-C/M-140
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
TRIBUTYL PHOSPHATE PURIFICATION BY DISTILLATION OVER ALKALIES. E. S. Lane. Feb. 1952. Decl. Feb. 1957. 6p. $0.32(BIS).

The purification of commercial tributyl phosphate by several treatments involving vacuum distillation has been assessed. The presence of approximately 10% of low boiling impurities in commercial material is indicated and a method for its removal suggested. (auth)

7120 AERE-CE/R-2408
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
PROPERTIES OF HEXONE IN RELATION TO ITS USE FOR URANYL NITRATE EXTRACTION. D. Bradley. 1958. Date of MS. Dec. 1953. Decl. Apr. 1957. 31p. $0.81(BIS).

Declassified version of AERE-CE/M-78.

This paper summarizes the properties of hexone, both chemical and physical, with particular emphasis on the partition of uranyl nitrate between hexone and water. (auth)

7121 ANL-5481
Argonne National Lab., Lemont, Ill.
THE HYDROLYSIS OF THE COMPOUND OF POTASSIUM WITH IRRADIATED GRAPHITE. W. L. Primak and L. A. Quarterman. Sept. 12, 1955. 6p. Contract W-31-109-eng-38. $0.15(OTS).

Potassium, the reaction product of graphite with potassium, and the reaction product of irradiated graphite with potassium were subjected to hydrolysis. The gases evolved from the respective samples were analyzed mass spectroscopically. Hydrocarbons (methane and a trace of ethane) were found in the gas evolved from the irradiated graphite compound only, and the quantity was about that which would have been expected from the number of non-aggregated displaced atoms. The result was obtained for a single set of experiments and must be considered suggestive rather than conclusive. (auth)

7122 IDO-14425
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
EFFECT OF GEOMETRICAL SHAPE ON THE CONTIN-

UOUS DISSOLUTION OF ALUMINUM IN MERCURY–CATALYZED NITRIC ACID. A. F. Boeglin and J. A. Buckham. Dec. 31, 1957. 26p. Contract AT(10-1)-205. $4.80(ph OTS); $2.70(mf OTS).

The results of a study of the effect of geometrical shape of aluminum reactor fuel elements on the dissolution rate in mercury-catalyzed nitric acid are presented. Four shapes, round rods, tubes, flat plates, and flattened tubes, were tested at five catalyst concentrations (from 1.5×10^{-6} to 7.5×10^{-4} molar mercury), and at each of three feed rates (280, 140, and 70 gram-moles of nitric acid per hour). Statistical analysis of the data showed that the main effects, feed rates, catalyst concentration and shape, and all first order interaction effects had a significant effect on dissolution rate. A mathematical relationship between dissolution rate and feed rate, catalyst concentration and the catalyst concentration by feed rate interaction was graphically developed for each shape. At the higher catalyst concentrations, all shapes dissolve at practically the same rate. However, flat plates and flattened tubes are much less dependent on catalyst concentration and at lower catalyst concentrations dissolve over twice as fast as round rods and tubes. Correlation of the dissolution rates of round rods with the rates obtained in previous work on cylindrical uranium–aluminum alloy fuel elements showed very good agreement. A comparison of the dissolution rate obtained in a stainless steel vessel and that obtained in a glass vessel was made; no appreciable difference was noted. (auth)

7123 IDO-28000
Aerojet General Corp., Azusa, Calif.
THE REACTION OF METALS WITH WATER AND OXIDIZING GASES AT HIGH TEMPERATURES. H. M. Higgins and R. D. Schultz. Apr. 30, 1957. 116p. Contract AT(04-3)-44. $0.60(OTS).

The molten metals, zirconium, Zircaloy-2, aluminum, uranium, sodium–potassium alloy, and stainless steel, were sprayed into water. The Aerojet Explosion Dynamometer was used in these tests to permit the measurement of explosive power, reaction time, reaction efficiency, and the effects of temperature and droplet size. It was shown that the percentage of reaction depends primarily on the particle size and on the temperature of the metal. It was found that the reactivity of molten aluminum is nil at temperatures up to 1170°C. At temperatures above 1170°C, the reaction becomes increasingly more complete. At a temperature of 2200°C, aluminum was found to be a more powerful reactant than zirconium. Stainless steel was slightly less powerful than zirconium under these conditions. (auth)

7124 NYO-1349(Rev.)
Mallinckrodt Chemical Works, St. Louis.
RESEARCH AND DEVELOPMENT PROGRESS REPORT. A. E. Ruehle and W. M. Leaders. Oct. 15, 1952. Decl. Aug. 13, 1957. 141p. Contract W-14-108-Eng-8. $2.75 (OTS).

Progress is reported on the following projects; ether extraction of $UO_2(NO_3)_2$, pitchblende ore slurry fibration, V and Mo solubility, use of surface active agents, breaking of raffinate foams, denitration of raffinate, continuous denitration of $UO_2(NO_3)_2 \cdot 6H_2O$, reactivity of UO_3, films of Mg, production of U alloys, reaction of U metal with MgO, metal recasting development, progress on the metallographic laboratory program, recovery of U and MgF_2 from MgF_2 bomb slag, decomposition of MgF_2, and hydrolysis of U metal. (W.L.H.)

7125 TID-5341(Rev.)
Westinghouse Electric Corp. [Pittsburgh].
CLEANING AND PICKLING OF CORE COMPONENTS, QUALITY DETERMINATION COUPONS, AND ASSEMBLIES. Feb. 22, 1956. Second Revision Dec. 13, 1957. Decl. Feb. 27, 1958. 7p. (PS-AP-292489(Rev. 2). $1.80 (ph OTS); $1.80(mf OTS).

Specifications are given for cleaning, pickling, rinsing, and drying of core components, quality determination coupons, and assemblies. (W.L.H.)

7126 WAL-TR-397/10
Watertown Arsenal Lab., Mass.
THERMAL CONDUCTIVITY OF TEFLON, KEL-F, AND DUROID 5600 AT ELEVATED TEMPERATURES. Arnold W. Schultz and Anthony K. Wong. Mar. 1958. 22p. DA Project 516-05-010.

The thermal conductivity values of the fluorocarbon plastics, Teflon, Kel-F, and Duroid 5600, were determined at mean specimen temperatures ranging from approximately 185°F to their respective gel-points. Measurements were obtained utilizing a comparative method technique based on unidirectional steady-state heat-flow theory. The materials under investigation were of commercial quality and were annealed prior to testing to insure dimensional stability. For the range of temperatures within which the materials were investigated, it was found that Teflon consistently exhibited higher values than Kel-F and lower values than Duroid 5600. At 350°F, the thermal conductivities obtained were: Teflon, 2.37 Btu/hr/ft^2/°F/in.; Kel-F, 1.72 Btu/hr/ft^2/°F/in.; and Duroid 5600, 3.58 Btu/hr/ft^2/°F/in. The thermal conductivities were found to increase with increasing temperatures. (auth)

7127 AEC-tr-3168
STUDY OF THE $BiCl_3$+3Ag ⇌ 3AgCl + Bi SYSTEM. T. I. Sokolova. Translated by Alex Hershaft from Izvest. Sektora Fiz.-Khim. Anal., Inst. Obsrchei Neorg. Khim., Akad. Nauk S.S.S.R. 21, 159-71(1952). 23p.

In order to explain the phenomenon of separation of metallic bismuth, the $BiCl_3 + 3Ag \rightleftharpoons 3AgCl + Bi$ system was studied by thermal analysis and microstructural techniques. Results of the work showed that the reaction $BiCl_3 + 3Ag = 3AgCl + Bi$ is reversible and equilibrium is displaced in the direction of the formation of AgCl + Bi. (auth)

7128 AEC-tr-3169
CHEMICAL STRUCTURE OF FERROUS OXIDE FROM DATA ON MAGNETIC PROPERTIES OF IRON OXIDES AT HIGH TEMPERATURES. S. M. Ariya and G. Grossman. Translated by Michael Roman from Zhur. Neorg. Khim. 1, 2210-15(1956). 12p.

Results of measurements of magnetic susceptibility of FeO, Fe_2O_3, and Fe_3O_4 at high temperatures to determine the chemical structure are described. (W.L.H.)

7129 AEC-tr-3172
RETAINING CAPACITY OF POROUS ADSORBENTS. A. B. Greenburg, D. H. Strazhesko, and M. V. Tovbin. Translated from Zhur. Fiz. Khim. 28, 81-6(1954). 10p.

By the use of a tracer technique, an investigation was carried out on the kinetics of the desorption of iodine from activated coal by carbon tetrachloride at small saturations. It was shown that at these small magnitudes of adsorption the desorption rate is determined by diffusion. The kinetics of the isotopic exchange was investigated between iodine adsorbed by coal and iodine dissolved in carbon tetrachloride. An hypothesis for the reason for the retaining capacity of porous adsorbents was advanced. (J.S.R.)

7130 AEC-tr-3175
THE ACTIONS OF RADIATIONS IONIZED BY WATER AND AQUEOUS SOLUTIONS. Marc Lefort. Translated by J. Allen Taylor from J. chim. phys. 47, 776-94(1950). 48p.

Oxidations and reductions brought about by radiations in aqueous solutions are discussed. The different systems

studied are: potassium iodide; iodine; nitrate; and a colorless fluorescein-fluorescin compound. (W.L.H.)

7131 AEC-tr-3181

PRODUCTION OF SINGLE CRYSTALS OF BARIUM TITANATE. Hubert Eustache. Translated from Compt. rend. 244, 1029-31(1957). 3p.

Experiments in cooling a solution of TiO_3Ba in KF in the presence of traces of Fe_2O_3 in a platinum crucible are described. The experimental conditions produce "butterfly wings" owing to the growth of dendrites of barium titanate: two films grow on a hinge of titanate which are thinner the more rapid the crystallization. It has been decided to seek those conditions which would be more favorable to the growth of single crystals. (auth)

7132 AERE-Trans/11/3/5/984

MODEL EXPERIMENTS ON CYCLONES. G. Hausberg. Translated by F. Hudswell from Forschungsber. Wirtsch.- u. Verkehrsministeriums Nordrhein-Westfalen, No. 140 (1955). 58p.

An attempt is made to present the regularities which must be observed in the execution of model experiments on dust extractors. Particular attention is paid to the effect of the disperse constituent on the physical constant of the mixture. (W.L.H.)

7133 NP-tr-49

THE ELECTROCHEMISTRY OF FUSED SALTS. P. Drossbach. Translated by M. H. Rand from Excerpt (p.14-100) of book published by Springer-Verlag, Berlin, 1933. 57p.

The electromotive force of a galvanic cell containing a mixed electrolyte is discussed, pointing out that all processes at the electrodes take place at a fixed rate in a definite manner. The polarization voltage at high current densities is greater than the equilibrium value which fluctuates. A number of important rules concerning conductivities and densities of fused salts and conditions governing current efficiency and energy consumption are discussed, along with polarization voltages and sources of error. The only thorough investigation of a metal's solubility in its fused salt is the work on the $Bi/BiCl_3$ system. The construction of electrolysis apparatus and some modifications are described along with methods of operation. Mathematical development and experimental proof are presented throughout to support information given. (J.R.D.)

7134 NRL-Trans-604

SOLID SOLUTIONS OF $Bi_2Te_3-BiSe_3$ AS MATERIALS FOR THERMO-ELEMENTS. (Tverdye Rastvory $Bi_2Te_3-BiSe_3$ kak Materialy dlya Termoelementov). S. S. Sinani and G. N. Gordyakova. Translated by A. Pingell from Zhur. Tekh. Fiz. 26, 2398-9(1956). 4p.

Results of investigations of thermo-electrical properties of solid solutions of two compounds, Bi_2Te_3 and $BiSe_3$, are given. (W.L.H.)

7135 TT-704

STUDY OF THE THERMODYNAMICS OF THE REACTIONS $ThO_2 + C + 2Cl_2 = ThCl_4 + CO_2$ AND $ThO_2 + C = Th + CO_2$ BY THE E.M.F. METHOD. (Izuchenie Termodinamiki Reaktsii $ThO_2 + C + 2Cl_2 = ThCl_4 + CO_2$ i $ThO_2 + C = Th + CO_2$ Metodom Elektrodvizhuschikh Cil). M. V. Smirnov and I. E. Ivanovskii. Translated by D. A. Sinclair from Zhur. Neorg. Khim. 2, 238-43(1957). 15p.

The emf of a cell with chlorine and oxide-carbon electrodes of thorium in a molten eutectic mixture of lithium potassium chlorides containing 3.07% by weight $ThCl_4$, $ThO_2 + C$ | 3.07% by wt. $ThCl_4$ + eutectic LiCl + KCl_{molten} | Cl_2C was measured. It is found that in the range of 655 to 900°C it varies linearly with the temperature in accordance with the empirical equation $E = (0.4005 + 4.967 - 10^{-4}\ T) \pm 0.0033$ v. The calculated changes of isobaric potential in the chlorination reactions for the formation of solid, liquid, and gaseous thorium tetrachloride, respectively are given. The calculated change of isobaric potential for the reaction in which thorium oxide is reduced with carbon to metallic thorium is: $ThO_{2\,solid} + C_{solid} = Th_{solid} + CO_{2\,gas}$, $\Delta Z = (200{,}090 - 77.47\ T) \pm 1{,}134$ cal./mole. The standard heat of formation of ThO_2 determined from the results of direct emf measurements of suitable equilibrium galvanic cells with molten electrolytes is equal to −294.1 kcal./mole, if −94.052 is taken as the standard heat of formation of CO_2. (auth)

7136

INVESTIGATION OF IODIDE METHOD OF ZIRCONIUM REFINING. COMMUNICATION 2. LOWER ZIRCONIUM IODIDES AND EFFECT OF TETRAIODIDE PRESSURE ON RATE OF DEPOSITION OF THE METAL. V. S. Yemel'yanov, P. D. Bystrov, and A. I. Yevstyudhin. Atomnaya Energiya No. 3, 122-31(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11437)

An investigation was made of the influence of lower iodides (LI) and vapor pressure of ZrI_4 on the process rate of zirconium refining by the iodide method. Following refining, LI are found on the surface of the raw metal in the form of black, black-brown, occasionally bluish-black bloom. The deposit approximates ZrI_3 in composition at reaction flask temperatures of 300 to 500°, and that of ZrI_2 at 620°. Combining of ZrI_4 at LI at the surface has as a final result, elimination of excess ZrI_4 on prolonged iodizing and consequently a decrease of its pressure in the reaction flask, which in turn changes the rate. The authors believe that other important factors which affect the rate of the process at pressures of $ZrI_4 > 0.2$ to 0.3 mm Hg are inhibition of diffusion process of metal transfer, due to lowering of diffusion coefficient of gaseous phase components on increase in pressure, and formation of LI at surface of incandescent Zr rod.

7137

THERMODYNAMICS OF NONSTIOCHIOMETRIC NICKEL TELLURIDES. I. HEAT CAPACITY AND THERMODYNAMIC FUNCTIONS OF THE δ PHASE FROM 5 TO 350°K. E. F. Westrum, Jr., C. Chou, and R. E. Machol (Univ. of Michigan, Ann Arbor) and F. Grønvold (Univ. of Oslo, Blindern, Norway). J. Chem. Phys. 28, 497-503(1958) Mar.

Heat capacities of the nickel tellurides were measured at compositions $NiTe_{1.1}$ and $NiTe_{2.0}$ (near limits of homogeneity of the δ phase) and at one intermediate composition, $NiTe_{1.5}$, from 5 to 350°K. Heat capacity values and entropy and enthalpy increments are tabulated. No evidence of order-disorder transitions, or thermal anomalies, or of contributions to the thermal properties from the anisotropy or phonon scattering by the holes in the structure on approaching the composition $NiTe_2$ was observed. Although simple additivity of the heat capacities of the constituent elements failed to represent that of the solution compositions adequately, a Kopp-Neumann treatment in terms of the limiting compositions of the δ phase gives good agreement with the experimental heat capacity and entropy of $NiTe_{1.5}$ and hence is useful in interpolating to other intermediate compositions. (auth)

7138

ON THE DIFFUSION OF A CHEMICALLY REACTIVE SPECIES IN A LAMINAR BOUNDARY LAYER FLOW. Paul L. Chambré and Jonathan D. Young (Univ. of California, Berkeley). Phys. of Fluids 1, No. 1, 48-54(1958) Jan.-Feb.

A chemically reactive species is emitted from the surface of a body located in a hydrodynamic flow field. It diffuses into the fluid where it undergoes a simple isothermal, homogeneous transformation. The analysis given

enables one to trace the reaction history of this component in a laminar boundary layer flow which develops over the surface of a body. For illustration the development of a first-order reaction in the neighborhood of a flat plate is calculated. Two reaction types are considered. In one case the reactant is destroyed; in the other, it is generated. The reaction histories show a number of interesting features which are discussed in some detail. (auth)

7139

EXPERIENCE IN THE OPERATION OF THE KIYALYKH-UZEN'SK BENEFICIATION PLANT. O. B. Klebanov. Tsvetnye Metal. No. 6, 1-11(1957).

The beneficiation plant built for the processing of copper and molybdenum sulfide ores is described. The defects in the design, design execution, and equipment are discussed. A flowsheet for the operation of the plant is given. Suggestions are made for the improvement of the plant operation and of future plant designs. (J.S.R.)

7140

INVESTIGATION OF ISOTOPE COMPOSITION OF BORON. B. Shyuttse. Zhur. Eksptl'. i Teoret. Fiz. 29, 486-9(1955). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11094)

To measure the isotope composition of B, use was made of a number of preparations of different origin. Considerable separation was detected on fractionation decomposition of KBF_4, in the course of which $KB^{11}F_4$ decomposes at first more than $KB^{10}F_4$. It was also found that on evaporation of B_2O_3 and $Na_2B_4O_7$ more molecules containing B^{11} pass into the gaseous phase than molecules containing B^{10}. Results are presented of the measurement of $B^{11}:B^{10}$ ratio in various samples of B-compounds.

7141

PREPARATION OF N^{15} CONCENTRATES IN A CASCADE UNIT BY CHEMICAL EXCHANGE METHOD. B. V. Ottesen and M. E. Aerov. Zhur. Fiz. Khim. 30, 1356-66(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11097)

Description is given of a unit for the daily production of 0.5 g nitrogen, in the form of NH_3, having N^{15} concentration of 40 at. %. Increase in N^{15} takes place according to the reaction: $(N^{14}H_4)_{sol} + (N^{15}H_3)_{gas} \rightleftharpoons (N^{15}H_4)_{sol} + (N^{14}H_3)_{gas}$. The cascade consists of three glass columns (K1, K2, K3) packed to a height of 9.4 m each. Packing of cylindrical spirals (diameter and height 2 to 4 mm), wound from steel wire (EYal-T Brand) is 0.2 mm in diameter. A 40% solution of NH_4NO_3 (4.2 l/hour) is fed by a diaphragm-piston pump into K1 on leaving which 0.5 l/hour of solution passes into K2 and 3.7 l/hour into reaction chamber connected to packed evaporation column wherein by action of alkali NH_4NO_3 liberates NH_3 which passes into K1. About 10% of solution that passed through K2 goes into K3 while from the remainder is liberated in analogous manner NH_3 that passes into K2. At egress of K3 final product is collected. From the remainder of solution is liberated NH_3 which passes into K3.

7142

CONCERNING ELECTROLYTIC REDUCTION OF NIOBIUM IN SOLUTIONS OF ITS SULFATE. Ye. I. Krylov and V. S. Kolevatova. Zhur. Prikład. Khim. 29, No. 8, 1292-5(1956). (Translated from Referat Zhur. Khim. No. 4, 1957, abstract No. 11362)

Study is made of the influence of current density i, temperature, and composition of electrolyte on yield, on basis of current consumption (YC), in the electrolysis of solutions of Nb^{5+}. YC is considerably higher with Pb than with Hg. On increase of i, on lowering of temperature and of Nb^{5+} concentration, YC drops. On increase of H_2SO_4 content YC increases only slightly. The results obtained are attributed to the influence of the factors under study on the diffusion rate of Nb^{5+} to the cathode.

7143

CHEMISTRY OF THE RARE RADIOELEMENTS, POLONIUM-ACTINIUM. K. W. Bagnall. New York, Academic Press, Inc. and London, Butterworths Scientific Publications, 1957. 183p.

All of the present data on the chemistry of polonium, astatine, francium, radon, radium, and actinium are collected and evaluated in this book. The methods used for the study of their chemistry are described. (J.S.R.)

7144

THE ROLE PLAYED BY CHEMICAL INDUSTRY IN NUCLEAR ENERGY. Robert Sartorius. pp. 201-29 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In French)

The chemical processing of uranium, as well as moderators and structural materials, is reviewed. The new chemical techniques, such as ion exchange resins and solvent extraction, are described. Remote-controlled plant installations for the processing of radioactive materials are discussed. (J.S.R.)

7145

SOME METHODS FOR THE EXTRACTION OF THORIUM METAL FROM ITS SALTS. Harold M. Finniston. pp. 399-412 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p.

Three methods for the production of thorium are considered—the calcium reduction of thoria, calcium reduction of thorium fluoride, and the preparation of the metal from its chloride. The purity of the metal obtained from each process is discussed. (J.S.R.)

Aerosols

7146

NATURAL BACKGROUND IN DETERMINATION IN RADIOACTIVITY OF AEROSOLS. Cestmir Jech. Ceskoslov. J. Phys. 6, No. 2, 192-200(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11427)

By measuring the activity of a paper filter after air had been drawn through it for 4 to 8 hours and by the method of nuclear photoemulsions, a determination was made of radioactivity of natural atmospheric aerosol, induced by products of disintegration of Rn. The two methods yielded about similar results. The activity-time curve comprises two portions of steep and gentle slope corresponding to disintegration of short-life (SL) and long-life (LL) isotopes. It is shown that the portion of activity induced by SL is approximately equal to the ratio of inclinations of activity curves of investigated specimen at t = 0 and SL activity without admixture of LL. For a more precise determination of the magnitude of this portion activity measurements should be carried out 2 days after preparation of the sample, in order that the products of Rn^{220} decay undergo complete disintegration during this period. Natural radioactivity of the air is most variable, the maximum activity being 35 times greater than the minimum. During individual days an appreciable increase in LL content was observed which the author attributes to tests of atomic weapons which were conducted in Nevada during that period.

Analytical Procedures

7147 AERE-C/R-852

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE ANALYSIS OF URANIUM–NIOBIUM ALLOYS. G. W. C. Milner. Jan. 22, 1952. Decl. Feb. 2, 1956. 17p.

A satisfactory procedure is described for the analysis of uranium–niobium alloys containing up to 25% niobium. It is based on the separation of the niobium from uranium by dissolving the cupferron complex of the former element into chloroform. After the evaporation of the solvent from the combined organic extracts, the niobium is ignited to the pentoxide. The uranium is afterwards precipitated from the remaining aqueous solution by the addition of ammonium hydroxide after the wet oxidation of organic matter. Absorptiometric procedures are included for the determination of the small amounts of uranium co-extracted with the niobium and the trace amounts of unextracted niobium. (auth)

7148 AERE-C/R-2377 (3)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

GAMMA SPECTROSCOPY APPLIED TO RADIOACTIVATION ANALYSIS. PART 3. THE DETERMINATION OF COBALT IN IRON USING GAMMA-GAMMA COINCIDENCE MEASUREMENT. L. Salmon. Sept. 1957. 18p. $0.54 (BIS).

By measuring γ–γ coincidence and using pulse height selection, Co^{60} has been successfully measured in the presence of Fe^{59}. In applying this technique to the activation analysis of steel, determinations of 0.01% cobalt have been performed without recourse to chemical separation. Results from a short series of B.C.S. standard steels are in agreement with results previously obtained by activation and chemical separation. (auth)

7149 CI-193

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

THE SENSITIVITY OF THE RADIOACTIVATION METHOD FOR THE DETERMINATION OF TRACE IMPURITIES IN HIGHLY REFINED METALS. T. A. Eastwood. Aug. 12, 1952. 6p.

The lowest percentage of trace element impurities in high purity metals which could reasonably be expected to be determined by the radioactivation method of analysis was calculated. The results for 26 elements which may be found in refined lead, zinc, cadmium, indium, and tin are tabulated. The calculations are based on an 18-hr irradiation of 3 to 5 g of the metal in a high flux position of the pile. At the end of this time it is assumed that the sample is removed from the pile and a chemical separation, specific for the impurity being investigated, is made before counting begins. Additional assumptions are: half an hr for chemical operations, 100% chemical yield in the separation, and a disintegration rate of 10^5 per min. (this means 10^3 counts per min. at 1% counting efficiency at the beginning of counting. It is to be expected that for the determination of some elements on the list considerably preliminary experimental work will be required to achieve the full sensitivity given in the table. (auth)

7150 AEC-tr-3184

THE DETERMINATION OF OXYGEN, NITROGEN, AND HYDROGEN IN MOLYBDENUM, TUNGSTEN AND NIOBIUM. G. V. Bikhailova, Z. M. Turovtseva, and R. Sh. Khalitov. Translated by S. J. Rothman from Zhur. Anal. Khim. 12, 338(1957). 6p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 10445.

7151

DETERMINATION OF SODIUM AND PHOSPHORUS IN HUMAN CERVICAL MUCUS WITH ACTIVATION ANALYSIS. Erik Odeblad, Bjorn Westin, and Karl Gustav Malmfors (Karolinska Institutet and Nobel Inst. of Phys., Stockholm). Acta Radiol. 49, 137–40(1958) Feb.

The technique for the determination of the sodium and phosphorus in human cervical mucus with activation analysis is described. The amount of Na was found to be relatively constant but the amount of P was directly correlated to the amount of dry substance. (auth)

7152

VOLUMETRIC DETERMINATION OF URANIUM IN PRESENCE OF IRON. M. W. Desai and T. K. S. Murthy (Atomic Energy Establishment, Bombay). Analyst 83, 126-9(1958) Mar.

A volumetric method is described for the determination of uranium in presence of iron, phosphate, and nitrate. It is based on the oxidation of reduced uranium^{IV} with ferric sulfate and titration of the excess of ferric iron iodimetrically. Osmium tetroxide has been found to be a suitable catalyst for the reaction. (auth)

7153

SPECTROPHOTOMETRIC DETERMINATION OF URANIUM IN ORGANIC-SOLVENT SOLUTIONS. Z. I. Dizdar and I. D. Obrenović (Inst. of Nuclear Sciences "Boris Kidrich," Belgrade). Analyst 83, 177-9(1958) Mar.

The ammonium thioglycolate method of Davenport and Thomason is used in the spectrophotometric determination of uranium in aqueous solutions. The results of application of this method to the determination of uranium in various organic solvents, and in tri-n-butyl phosphate, diluted with various organic solvents, is presented. (J.R.D.)

7154

COLUMETRIC DETERMINATION OF URANIUM WITH APPLICATION OF FERRICYANIDE. Valdimir Simon and Eugenie Priplatova. Chem. listy 50, No. 6, 907-10(1956). (Translated from Referat. Zhur. Khim. No. 6, 1957, abstract No. 19579)

The salts of U (6+) (15–50 mg of U) are reduced using 3% Zn amalgam and 5% H_2SO_4 in a separating funnel to $U(SO_4)_2$, the solution of which is stable in air 5 hours. After the removal of the amalgam, the U^{4+} solution is neutralized with 3 to 5 g of $NaHCO_3$, 2 to 3 g of KCN and 1 g of NH_4Cl are added, and U^3 is oxidized to UO_2^{2+} with 0.1 N solution of $K_3Fe(CN)_6$ by the potentiometric method at 18 to 28° and in the air. The angular factor at the inflection point is about 1400. Pb, Bi, Cu, Sn, As, Sb, Zn, Ni, Co, Cr, Ca, Mg, Th, Be, WO_4^{2-} and little amounts of Ti, Fe, and Al do not interfere. The interfering influence of a large amount of Fe is checked by the addition of tartaric or citric acid or F^-. Ag, Cd, Mn, V and Ce interfere. The described method was applied to the determination of U in ores. (auth)

Deuterium and Deuterium Compounds

7155

ON THE STRUCTURE OF THE ADSORPTION BANDS OF THE LIQUID H_2O, D_2O AND HDO, AS DETERMINED BY THEIR MOLECULAR STRUCTURE. M. O. Bulanin. Optika i Spektroskopiya 2, No. 5, 557-61(1957).

The vibrational spectrum of liquid water has been studied by many people both using Raman scattering and infrared

absorption. The experimental material available is, however, both contradictory and incomplete. This in particular applies to heavy (D_2O) and "semi-heavy" (HDO) water. This paper reports measurements of the infrared absorption spectra for liquid H_2O, D_2O, and HDO in the region of valence frequencies of OH and OD at 2200 to 3700 cm^{-1}. Recording, single-beam infrared spectrophotometers were used. They had lithium fluoride prisms. The slit was not wider than 10 cm^{-1} at the wavelength of 3μ and 4 cm^{-1} at 3.7μ. The absorption bands in H_2O and D_2O were recorded for layers about 2μ thick, the HDO bands using 10μ layers. The absorption spectra of singly, doubly and trebly distilled water were obtained. The heavy water (D_2O) contained no less than 98% of deuterium. The experiments were carried out at 19 to 21°C. In the case of H_2O and D_2O the bands possess doublet structure with components at 3425, 3290, 2550, and 2435 cm^{-1}, respectively. This structure is due to overlap of the bands of symmetrical and antisymmetrical vibrations of the H_2O and D_2O molecules. The HDO bands have broad maxima around 3420 and 2510 cm^{-1}. These results agree with Pople's theory. Assuming that the structural ordering in liquid water is only of a local nature and taking into account the deformation of the hydrogen bonds, Pople found a curve of radial distribution which is close to that found experimentally. (TCO)

7156

VIBRATIONAL SPECTRA AND POTENTIAL ENERGY CONSTANTS OF DISILANE AND HEXADEUTERODISILANE. I. F. Kovalev (Saratovskii Pedagogical Inst.). Optika i Spektroscopiya 3, 552-9(1957) Dec. (In Russian)

The vibration spectra of Si_2H_6 and Si_2D_6 were calculated, and the constant potential energies (power coefficients, etc.) and the shapes of normal vibrations were evaluated and analyzed. (tr-auth)

7157

PROBLEMS CONNECTED WITH THE PRODUCTION OF HEAVY WATER IN ITALY. Mario Silvestri. pp. 301-13 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The economic aspects of the production of heavy water in Italy are discussed. Several feasibility studies of plants have been made. (J.S.R.)

7158

PROBLEMS CONNECTED WITH THE PRODUCTION OF HEAVY WATER IN THE UNITED KINGDOM. H. R. C. Pratt. pp. 315-34 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p.

In the United Kingdom efforts for the production of heavy water are concentrated on two lines of development: the hydrogen distillation process and a variety of chemical exchange methods. The various methods available for heavy water production are briefly discussed, and the advantages and disadvantages of each are summarized. (J.S.R.)

7159

REPORT ON RECENT ITALIAN EXPERIENCES IN THE PRODUCTION OF HEAVY WATER USING PROCESS ELECTROLYSIS AND PLATE TOWERS. S. Finzi, R. Renzoni, and M. Silvestri. pp. 353-75 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

Fluorine and Fluorine Compounds

7160 ANL-5441

Argonne National Lab., Lemont, Ill.

THE BEHAVIOR OF URANIUM, THORIUM, AND OTHER SELECTED MATERIALS IN BROMINE TRIFLUORIDE, BROMINE PENTAFLUORIDE, CHLORINE TRIFLUORIDE, AND FLUORINE AT ELEVATED TEMPERATURES. Lawrence Stein and Richard C. Vogel. May 1955. 20p. Contract W-31-109-eng-38. $0.20(OTS).

The reactivity of uranium, thorium, aluminum, copper, iron, magnesium, zirconium, and Fluorothene with bromine trifluoride, bromine pentafluoride, chlorine trifluoride, and fluorine was investigated at temperatures ranging from 25 to 410°C. The reactivity of platinum with bromine trifluoride was also studied. (auth)

Graphite

7161

KINETIC LAW OF FORMATION AND DECOMPOSITION OF OXIDES ON THE GRAPHITE SURFACE. Lucien Bonnetain, Xavier Duval, and Maurice Letort. Compt. rend. 246, 105-7(1958) Jan. 6.

Investigations were made of oxygen adsorption of artificial graphite following the desorption of CO and CO_2, which formed on the surface. It is shown that these two phenomena agree well with the Elovich kinetic law. (tr-auth)

7162

GRAPHITE FOR NUCLEAR REACTORS. H. W. Davidson. G.E.C. Atomic Energy Rev. 1, 130-40(1958) Mar.

The processes involved in the manufacture of carbon and graphite are described with particular reference to properties of importance to reactor engineers. The variable nature of the product is emphasized and the reasons for directional properties of moderator blocks are discussed. The structure of carbon and graphite is discussed in terms of the coke grains which are built up of graphite crystallites consisting of carbon atoms arranged in layer planes. The properties of a single crystal of graphite are listed for comparison. The effect of impurities in the graphite is briefly considered. The physical properties are described with particular reference to mechanical properties; chemical properties are discussed in terms of the reactions with carbon dioxide. Some of the effects of neutron irradiation on graphite are summarized. (auth)

Laboratories and Equipment

7163 CF-58-3-55

Oak Ridge National Lab., Tenn.

NUCLEAR ENGINEERING LABORATORY WITH A POINT NEUTRON SOURCE. H. S. Pomerance. Mar. 17, 1958. 11p. $3.30(ph OTS); $2.40(mf OTS).

The equipment necessary for a nuclear engineering laboratory with a point neutron source is discussed. Some general references on neutron work are listed. Experiments are outlined which use a neutron howitzer, a tank of water, a sigma pile, and a natural U and graphite exponential pile. (M.H.R.)

7164 NP-tr-43

THE SEPARATION OF SOLID PARTICLES FROM LIQUIDS BY MEANS OF A CYCLONE. E. Lindner. Translated by E. Poole from Maschinenbau-technik 5, 455-(?)(1956). 24p.

Cyclones are used to separate solid particles from liquids

(filtration), for the sorting of solids according to grain size (classification), or to separate solids or liquids according to their specific gravity (sorting). The shape, manner of operation, and various other matters concerning cyclones are dealt with in a short review of recent literature. Simple concepts are used in an attempt to explain the phenomena in cyclones, and to deduce lines for future research. The boundary-layer streamlines observed in a glass cyclone are briefly reported. (auth)

7165

THE G.E.C. POWER MANIPULATOR. D. J. Ingram and B. H. Stonehouse. G.E.C. Atomic Energy Rev. 1, 147-51 (1958) Mar.

A full description is given of a power-operated manipulator suitable for remote-handling operations in radioactive, or other dangerous areas. The manipulator consists of a single arm, with interchangeable grasping devices, controlled electrically from a console situated outside the dangerous area, and loads of up to 340 kg can be handled. (auth)

7166

A NEW LABORATORY FOR BERYLLIUM RESEARCH. John D. Abbatt, F. L. Griffiths, and P. J. Phennah. G.E.C. Atomic Energy Rev. 1, 154-9(1958) Mar.

After a brief summary of the precautions necessary when working with beryllium, a full description is given of a laboratory specially constructed for such work by the G.E.C. at Erith. Details, including illustrations, are given of the air-conditioning arrangements and of operating procedures. A brief description of the method used for monitoring beryllium concentrations is included. (auth)

7167

A GRAPHITE RESISTANCE FURNACE FOR PHYSICO-CHEMICAL STUDIES UP TO 2200°C. J. D. Mackenzie and J. O'M. Bockris (Imperial Coll., London). J. Sci. Instr. 35, 109-10(1958) Mar.

The design of a graphite resistance furnace with a controllable hot zone capable of reaching 2200°C and withstanding rapid temperature changes is presented. (J.R.D.)

7168

THE CLOSURE OF HIGH PRESSURE VESSELS: A HYDRAULIC HIGH-TORQUE TORQUE WRENCH. E. Whalley, A. Lavergne, and R. Goton (National Research Council, Ottawa, Can.). J. Sci. Instr. 35, 113-14(1958) Mar.

The design of a hydraulic torque wrench for use on hexagon head nuts capable of a wide range of torques is presented. (J.R.D.)

Molecular Structure

7169

QUANTUM MECHANICS OF THE H_3 COMPLEX. George E. Kimball and John G. Trulio (Columbia Univ., New York). J. Chem. Phys. 28, 493-7(1958) Mar.

A minimum energy and the associated nuclear configuration are given for linear symmetric H_3 in the ground ($^3\Sigma_u^+$) state. An LCAO MO wave function with complete configuration interaction, is constructed from a set of five 1S hydrogen-like orbitals with centers equally spaced on the line of nuclei. Apart from symmetry, nuclear positions and orbital centers are unrelated but the screening constant is the same for each orbital. The nonlinear parameters which were varied are the screening constant, internuclear distance, and the distance between adjacent orbital centers. An energy of -72.4 ± 0.5 kcal/mole (relative to three separated H-atoms) is obtained; the experimental value[2] is ~-103 kcal/mole. Many difficult 3- and 4-center repulsion integrals were evaluated numerically, using the CPC at Watson Scientific Computing Laboratory. The chief advantage of this model is that all the difficult integrals belong to one family characterized by essentially three parameters. Thus, all of them were computed from a single numerical program. (auth)

Radiation Chemistry

7170 AERE-C/R-2385

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE MONITORING OF EFFLUENT FOR ALPHA-EMITTERS. PART 3. RADIUM. E. N. Jenkins and G. W. Sneddon. 1958. Date of MS. Nov. 1953. Decl. with amendment Apr. 1957. 26p. $0.72(BIS).

Declassified version of AERE-C/R-1277.

A full use of the permissive terms of the Harwell Effluent Agreement requires regular radium analyses, probably at very low levels, in the presence of other alpha emitters. An existing (Argonne National Laboratory) co-precipitation method for radium in urine has been modified for this purpose. It has been shown that radium may be isolated almost quantitatively from treated effluents, in a state of radiochemical purity. It may be measured directly using the alpha scintillation counter Type 1093B, the lower limit of sensitivity of the method, without previous concentration of the sample, being about 2 dpm per liter (4 $\mu\mu$ curies per gallon). All alpha active radium isotopes are included; Ra^{226} may be distinguished by alpha growth measurements. (auth)

7171

EFFECT OF CHLORINE IONS ON THE RADIOLYSIS OF WATER BY THE γ RAYS OF Co^{60} IN ABSENCE OF AIR. Anne-Marie Koulkès-Pujo. Compt. rend. 246, 1203-6 (1958) Feb. 24. (In French)

The radiolysis of degassed water was studied in the presence of chlorine ion at constant intensity of 6×10^{18} ev/hr/cm^3. At pH 0 with Cl^- concentrations between 10^{-5} and 2.6 M the yield in H_2O_2 increases with the Cl^- concentration from 10^{-5} to 10^{-3} M, passes through a maximum between 10^{-3} and 10^{-2} M, and then decreases again from 10^{-2} to 1 M. At a concentration of 2.6 M free chlorine was detected in the solution. The maximum value of the yield in H_2O_2 formed is 0.36 moles for 100 ev, a value lower than the yield of H_2. O_2 is also formed, probably from the decomposition of H_2O_2. With a constant concentration of chlorine ions, but with a pH variation from 0 to 6, the H_2O_2 yield decreases between pH 2 and 3, and disappears at pH 5. From pH 11 to 14 with Cl^- 10^{-3} M, there is no formation of H_2O_2. The yield of H_2 remains constant to about pH 11.7, decreases abruptly from 0.46 to 0.22, again remains constant up to pH 13.3, and then decreases to approximately 0.08. Solutions of NaOH in the absence of all other solutes form H_2 with a yield of 0.23, then at pH 13.3 the H_2 yield decreases to a value of 0.08. An interpretation of the results is given. (J.S.R.)

7172

RADIOCHEMICAL REACTIONS CATALYZED IN AQUEOUS SOLUTION BY SEMICONDUCTORS AND METALS. Moïse Haïssinsky and Marcelle Duflo. Compt. rend. 246, 1206-9 (1958) Feb. 24. (In French)

The oxidation of uranium sulfate and potassium iodide and the reduction of ferric o-phenanthroline were studied in connection with the catalyzing effects of the oxides of thorium, tantalum, niobium, and titanium, cobalt sulfide, and platinum and palladium black. Gamma or x rays with an average effective energy of 19 kev were used. The solutions contained 3 to 5 mg/cm^3 of the catalyst and were

agitated during the irradiation. Thorium oxide and cobalt sulfide, in the presence of air, cause a large increase in the oxidation yield of uranium sulfate; tantalum and titanium oxides also increase the oxidation products, but only a very weak effect was noted with niobium oxide. Thorium oxide causes no detectable effect in the absence of air. Thorium oxide, tantalum oxide, and niobium oxide increase the radio oxidation of potassium iodide. The total yield in the reduction of ferric o-phenanthroline increases in the presence of cobalt sulfide, thorium oxide, platinum black, and palladium black. Thorium oxide caused no effect on degassed solutions. (J.S.R.)

7173

RADIOCHEMICAL POLYMERIZATION AT HIGH INTENSITIES. Adolphe Chapiro and Jeanne Sebban-Danon. J. chim. phys. 54, 776-9(1957) Oct. (In French)

Results of experiments on polymerization of styrene, methyl methacrylate, and acrylonitrile, induced by high-energy x rays are given. (R.V.J.)

7174

UTILIZATION OF RADIATION; INTERNATIONAL SYMPOSIUM ON MACROMOLECULAR CHEMISTRY IN PRAGUE. G. Kratochvil. Jaderna Energie 4, No. 1, 28(1958) Jan. (In Czech.)

7175

RADIATION PROTECTION IN CYCLOHEXANE. Milton Burton, J. Chang, S. Lipsky, and M. P. Reddy (Univ. of Notre Dame, Ind.). Radiation Research 8, 203-13(1958) Mar.

7176

THE RADIOLYSIS OF TRIBUTYL PHOSPHATE. John G. Burr (Oak Ridge National Lab., Tenn.). Radiation Research 8, 214-21(1958) Mar.

Radiation Effects

7177

COMPARED EFFECT OF THE γ RADIATION OF Co^{60} ON THE PARA-DI-HALOBENZENES. Joseph Depireux (Institut d'Astrophysique de l'Universite de Liege, Cointe-Schlessin). Acad. roy. Belg. Classe sci. 43, No. 10, 751-5(1957). (In French)

The pure quadrupole spectra of p-dihalobenzenes are studied with respect to the influence of gamma rays of Co^{60} on the resonance intensity. It is shown that anomalies encountered among the values of the radiosensitivity of these compounds may be explained from considerations based on their crystal structures. (tr-auth)

7178

CRYSTALLINITY CHANGES IN IRRADIATED POLYETHYLENES. A. Charlesby and L. Callaghan (Royal Military Coll. of Science, Shrivenham, Wilts and Tube Investment Research Labs., Cambridge, Eng.). Phys. and Chem. of Solids 4, 306-14(1958).

The destruction of crystallites in polyethylene exposed to radiation has been followed by measurements of specific volume. For equal energy absorption, pile radiation is far more effective than electrons in disrupting crystallites, possibly because of the interaction of fast neutrons with the hydrogen atoms. The larger crystals are more readily destroyed in both low- and high-density polyethylene. An extrapolation of the specific-volume temperature curve to 0°K gives an approximately constant value ν_0 for the specific volume, whether the material be amorphous, lightly crosslinked (as in a rubber), highly crosslinked (as in a glass-like state), or crystalline. The specific volume ν at any temperature T can be written in the form $(\nu-\nu_0)(P + P_0 + P_r r) = RT/M$, where P is the external pressure, P_0 the internal pressure, $P_r r$ is the equivalent of an internal pressure arising from the crosslinks produced by a radiation dose r, R is the gas constant and M the unit molecular weight (28 for C_2H_4 in polyethylene). (auth)

Rare Earths and Rare-earth Compounds

7179

ON THE DOUBLE SALTS OF LANTHANUM, CERIUM, PRAZEODYMIUM, AND NEODYMIUM WITH TRIPHENYLBENZYLARSONIUM NITRATE. G. V. Medoks (Saratov State Agricultural Inst.). Doklady Akad. Nauk S.S.S.R. 117, 993-5(1957) Dec. 21. (In Russian)

The solubility of binary salts of the rare elements in organic salts was investigated. (R.V.J.)

7180

ON THE SEPARATION OF THE RARE EARTHS WITH ETHYLENEDIAMINE TETRAACETIC ACID. VII. CYCLIC PROCESS FOR THE FRACTIONATION OF CERRIC EARTHS. G. Brunisholz and R. Cahen (Univ. of Lausanne, Switzerland). Helv. Chim. Acta 41, 460-7(1958). (In French)

The previously outlined cyclic process (Helv. Chim. Acta 38, 1655(1955)) for the fractionation of the cerium earths is discussed. (auth)

7181

USE OF A CALIBRATION CURVE (NOMOGRAM) IN SPECTRAL ANALYSIS OF RARE-EARTH ELEMENTS BY THE METHOD OF ADMIXTURES. A. I. Akimov. Optika i Spektroskopiya 2, No. 6, 809-11(1957).

Since the chemical properties of rare-earth elements are very similar, it is difficult to prepare these substances in their pure form. Standards used in spectral analysis of these elements are in the form of samples which have a certain amount of impurity. This paper deals with determination of this quantity. This quantity is determined by the method of admixtures which is based on the following two assumptions: (1) that all standards are prepared from the same original sample; small additions of impurities are made to portions of such a sample; and (2) that the following law is obeyed: $\log R = \log a + b \log(C + x)$, where R is the ratio of intensities of spectral lines of the pair used for analysis, $(C + x)$ is the amount of impurity present in the standard, and a and b are constants. The author gives a nomogram for determination of the impurities. This nomogram is used to find the amount of Nd in Sm. The values of impurity found using the nomogram agree well with those determined chemically. (TCO)

7182

THE RARE EARTH ELEMENTS THULIUM AND PROMETHIUM BECOME TECHNICALLY VALUABLE. B. I. Kogan. Tsvetnye Metal. No. 6, 92-5(1957).

A survey of non-Slavic (mainly American) literature on thulium and promethium is given. Their preparation, properties, and uses are considered. Thulium is used in flow detection, and promethium is used in miniature batteries. 20 references. (TCO)

Separation Procedures

7183 AERE-C/R-2277

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

FISSION PRODUCT SEPARATION BY ION-EXCHANGE. F. Morgan and M. L. Sizeland. 1957. Date of MS. 1952. Decl. Apr. 1957. 19p. $0.54(BIS).

A remote-control apparatus has been built and operated

for the separation and concentration of the major long-lived fission products by ion exchange: operating details and desirable improvements are given. Factors governing the ion exchange separation of the rare earths are discussed and illustrated. (auth)

7184 CF-55-10-153
Oak Ridge National Lab., Tenn.
WATER DECONTAMINATION: AN ION EXCHANGE PILOT PLANT STUDY. William J. Lacy and Don C. Lindsten. Oct. 21, 1955. 13p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

Under certain circumstances, water supplies may contain appreciable concentrations of radioisotopes from hospitals, university research laboratories, industries, or the use of atomic or thermonuclear weapons. Many methods of water decontamination are in use and have been reported on including adsorption, coagulation, distillation, and ion exchange. Ion exchange materials and processes have been used for many years for water softening. More recently they have been used on a laboratory scale to study their effectiveness for removing radioactive ions from contaminated solutions. Reported here are the results of an ion exchange study on a much larger scale. The investigation not only included the effectiveness of the method for removing the radioactive material but also some measurements on the radiation hazard involved. (auth)

7185 DOW-11, DOW-12, and DOW-13
Dow Chemical Co. Great Western Div., Pittsburg, Calif.
PROGRESS REPORTS FOR JANUARY, FEBRUARY, MARCH 1949. R. H. Bailes. (DOW-11, Feb. 7. Decl. Dec. 28, 1955. 15p.; DOW-12, Mar. 10. Decl Dec. 28, 1955. 28p.; and DOW-13, Apr. 14. Changed from OFFICIAL USE ONLY Mar. 14, 1958. 37p.) Contract AT-30-1-GEN-236. (DOW-11, $3.30(ph OTS); $2.40(mf OTS); DOW-12, $4.80(ph OTS); $2.70(mf OTS); and DOW-13, $6.30(ph OTS); $3.00(mf OTS).)

These three reports were issued separately, but are cataloged as a unit.

The construction and operation of a test plant for the reduction and precipitation of U from 50 to 100 lb batches of 35% H_3PO_4 are described. A study of the efficiency of extraction of U from the fluoride precipitate by sodium carbonate leaching is discussed. The effect of temperature, time, concentration, and volume concentration on the HCl leaching process of the fluoride precipitate was studied. Studies are presented on the removal of U from 35% H_3PO_4 with commercial anion exchange resins. (W.L.H.)

7186 DOW-17, DOW-18, and DOW-19
Dow Chemical Co. Great Western Div., Pittsburg, Calif.
PROGRESS REPORTS FOR JULY, AUGUST, SEPTEMBER 1949. R. H. Bailes. (DOW-17, July 28. Decl. Dec. 28, 1955. 35p.; DOW-18, Aug. 30. Decl. Mar. 14, 1958. 68p.; and DOW-19, Sept. 30. Decl. Dec. 28, 1955. 25p.) Contract AT-30-1-GEN-236. (DOW-17, $6.30(ph OTS); $3.00 (mf OTS); DOW-18, $10.80(ph OTS); $3.90(mf OTS); and DOW-19, $13.80(ph OTS); $4.80(mf OTS).)

These three reports were issued separately, but are cataloged as a unit.

Recovery of U from commercial 30% H_3PO_4 by ion exchange and fluoride precipitation is described. The precipitation of U from leach liquors with NaOH and $NaHSO_3$ and the precipitation of U from 30% H_3PO_4 with Sb are described. An investigatinn of the fluorimetric method for the analysis of U is presented. (W.L.H.)

7187 DOW-43, DOW-45, and DOW-48
Dow Chemical Co. Western Div., Pittsburg, Calif.
URANIUM RECOVERY FROM INDUSTRIAL PHOSPHORIC ACID. Progress Reports for January, February, March 1951. R. H. Bailes. (DOW-43, Jan. 26. Decl. Dec. 9, 1955. 36p.; DOW-45, Mar. 2. Changed from OFFICIAL USE ONLY Mar. 14, 1958. 50p.; and DOW-48, Apr. 5. Changed from OFFICIAL USE ONLY Mar. 14, 1958. 66p.) Contract AT-30-1-GEN-236. (DOW-43, $6.30(ph OTS); $3.00(mf OTS); DOW-45, $9.30(ph OTS); $3.60(mf OTS); and DOW-48, $10.80(ph OTS); $3.90(mf OTS).)

These three reports were issued separately, but are cataloged as a unit.

The use of ion exchange resins to recover U and V from industrial H_3PO_4 is presented. (auth)

7188 DOW-123
Dow Chemical Co. Western Div., Pittsburg, Calif.
CARNOTITE SOLVENT EXTRACTION PROCESS: PROCESS DESCRIPTION. J. Frank Valle-Riestra. Nov. 10, 1954. Decl. Mar. 6, 1958. 85p. Contract AT-30-1-GEN-236. $15.30(ph OTS); $5.40(mf OTS).

A preliminary design was prepared for a plant to recover uranium and vanadium from 200 tons per day of carnotite by means of solvent extraction. The rock can be processed with an over-all recovery of at least 89.5% of U_3O_8 and 84.0% of V_2O_5. A complete process description is included. A pilot plant progress report is also included; data obtained so far substantiate the laboratory data on the basis of which the large plant was designed. (auth)

7189 MITG-A30
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
FLOTATION OF URANINITE FROM OTHER MINERALS. Gilman Yost Murray. May 23, 1947. Decl. Apr. 11, 1956. 61p. $0.40(OTS).

It is possible to float uraninite selectively from some of the gangue minerals with which it occurs. Oleic acid was found to be an excellent collector, giving over 98% recovery and a very low assay rejectable tailing. With the standard synthetic ore mixture ground to 96% minus 100 mesh, 3.2 pounds per ton of collector, in a pH range of 6 to 6.9, was found to give optimum results but good results were obtained in the pH range of 5. to 7.5. The investigation did not disclose any beneficial effect of any modifier or collector which was better than or equal to oleic acid, but further investigation is indicated. A minor portion of the work was carried out with pure mineral gangues of quartz, pyrophyllite, pyrite, and hematite. Excellent differential flotation of the uraninite from quartz can be accomplished with as little as 0.2 pound per ton of oleic acid. Pyrite and pyrophyllite can be floated from the uraninite, using xanthate and frothers, respectively. More work will have to be carried out before a uraninite–hematite separation can be made. This investigation can be considered as only a start toward the solution of determining the exact conditions under which uraninite can be floated from each of the gangue minerals with which it is found. (auth)

7190 NYO-4876
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Progress Report. Jan. 31, 1958. 40p. Contract AT(30-1)-956. (MITS-38). $1.25(OTS).

The adsorption of dodecylamine on quartz is discussed. The adsorption experiments are conducted through agitation of a known quantity of powdered quartz in a polyethylene bottle filled with test solution. The amount of adsorption was calculated from the difference in optical densities of the initial and final solutions. Preparation and analysis of hexylamine hydrochloride, preparation of

quartz, and the adsorption of hexylamine hydrochloride on quartz from aqueous solutions of varying ionic strength are given. Some experiments have been made on the exchange of Zn^{65} with nonradioactive Zn for sphalerite in contact with aqueous Zn solutions. The ion exchange processes which take place between muscovite and an electrolyte solution are described. Thermal expansion measurements were performed on crystals of pink and white microcline. Measurements of the electrical resistance of chrysocolla and chromite are described. (For preceding period see NYO-4871.) (W.L.H.)

7191 ORNL-2466
Oak Ridge National Lab., Tenn.
PROGRESS REPORT ON RAW MATERIALS FOR NOVEMBER 1957. Chemical Technology Div. K. B. Brown, C. F. Coleman, D. J. Crouse, and A. D. Ryon. Mar. 11, 1958. 32p. Contract W-7405-eng-26. $1.00(OTS).

Uranium extraction coefficients with Amberlite LA-2 were lower than those with most other commercial secondary amines. Kerosene-tridecanol solutions of an N-alkyl-β-aminocarboxylic acid extracted U strongly from dilute nitrate solution, where the simple amines do not extract. Preliminary tests of U extraction from sulfate solutions are described. Data are given on di(2-ethylhexyl)phosphate losses to alkaline solutions, solubility distribution losses of monoalkylphosphoric acids, and mono(2,6,8,-trimethylnonyl-4)phosphoric acid loss from kerosene solution to aqueous acidic liquors. Study was continued of cation exchange in hydrocarbon solutions of di(2-ethylhexyl)phosphate as a possible means of extracting radioactive strontium from waste solutions. Isotherms were determined for extraction of U from synthetic Marysvale liquor with a new amine, Amberlite LA-2. Data are given on the extraction of vanadium and phosphate with amines. Solvent entrainment studies in mixer settlers are described. The determination of molecular weights of amine species in benzene solution by light scattering is described. (For preceding period see ORNL-2451.) (W.L.H.)

7192 NP-tr-59
RESEARCHES ON THE MAGNETIC SEPARATION OF ORES. R. Tille and W. Kirkpatrick. Translated by N. Willis from Z. Erzbergbau u. Metallhüttenw. 8, Beih. B117-25(1955). 21p.

The fundamental formulas are derived for the force which acts on a particle in a magnetic field, and the simplification of these formulas is given for the case of weakly magnetic ores. The researches carried out with the aid of a Frantz isodynamic separator are then described. This separator is particularly suited to the treatment of complex ores and their separation from one another, the measurement of their susceptibilities, the estimation in advance of the capacity of industrial separators and the control of the industrial separating plants. The second part of the work is concerned with the calculation of the parameters of a magnet used in an industrial separator. (auth)

7193 NP-tr-60
APPLICATION OF FACTORIAL DESIGN TO INVESTIGATION OF ORE-DRESSING AT TOUISSIT. G. Boyard. Translated by R. C. Murray from Z. Erzbergbau u. Metallhüttenw. 8, Beih. B221-8(1955). 21p.

The fundamentals of the factorial design method are expounded. A table of variances of the individual factors and groups of factors in a very simple example of the application of the method to lead mineral flotation is compiled. A more complicated example is studied, namely the influence of six flotation reagents, used in the lead circuit at Touissit for the depression of zinc blende. The study is based on a simplified factorial plan, in which instead of the theoretical 128, only 64 laboratory experiments are performed. The calculation of the variances of the factors and their interactions of the first and second orders, of the residual variances, the application of the Snedecor test to determine the significance of the variances and finally the analysis of these variances by the Student-Fisher test are described. The numerous deductions derived from an analysis of the five significant interactions are listed. Some general conclusions regarding the application of factorial design to the investigation of ore beneficiation are presented. (auth)

7194
INVESTIGATION OF ISOTOPE COMPOSITION OF LITHIUM. K. Ordzhonikidze and B. Shyuttse. Zhur. Eksptl'. i Teoret. Fiz. 29, 479-85(1955). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11093).

Investigation was made of the effects of separation of Li isotopes on evaporation of Li^+ ions from the surface of W-powder and on ionization of molecular clusters of Li compounds by an electronic beam. In the former case, within the temperature interval 800 to 1200°, on evaporation of Li^+ ions the ratio $Li^7 : Li^6$ increases with time, starting with the value 11.42. At higher temperatures $Li^7 : Li^6 = 12.48$ which practically coincides with the true value (12.47) derived by the integral method. By the described procedure was measured the isotope composition of Li in four minerals. In the second instance slight separation effects were detected.

7195
THE SEPARATION OF RADIOACTIVE ISOTOPES BY COMPLEX FORMATION. N. P. Rudenko. Zhur. Neorg. Khim. 1, No. 5, 1091-1103(1956). (Translated from Referat. Zhur. Khim. No. 3, 1957, abstract no. 7408).

A survey is made of the possibilities for the utilization of complex formation (CF) in the separation of isotopes. A graphic presentation of the data of R.N. Maslova on the influence of pH, composition, and concentration of the solution on the extraction (E) of yttrium oxyquinolinate with chloroform is given. The formation of the extractable complex proceeds by a substitution and an addition reaction. The effect of the various factors is reduced to the shift in the CF reaction. Salting-out action leads to a decrease in the solubility of the extractable complex. CF cannot proceed to any extent during the electrolytic separation of the isotopes without a carrier. The original method of E.V. Pastukhov in which the daughter radioactive element is separated by the electrolysis of the complex-containing solution in an organic solvent is described. In^{113m} is separated from the parent Sn^{113} by the electrolysis of the oxyquinolinate of Sn in CH_3Cl. When a field strength of 3,000 v cm^{-1} is used, 76% of the In^{113m} is deposited on the electrodes, of which amount 96% is deposited on the anode. The deposition of Sn on the electrodes increases with time as a result of the formation of Sn ions by radioactive decomposition. In^{115m} is separated from the parent Cd^{115} by the electrolysis of a saturated solution of $Cd(C_5H_5N)_4(SCH)_2$ in CH_3Cl. When a field strength of 500 v cm^{-1} is used, 60% of the In is deposited on the electrodes; at 2,000 v cm^{-1}, deposition of In is 100%. Most of the In is deposited at the cathode (99.7%), while the Cd (some 5% of the total Cd) is deposited primarily at the anode. In^{115m} can also be separated from Cd by extraction of In oxyquinolinate in chloroform. (auth)

Sorption Phenomena

7196 NP-6636
Canada. Dept. of Mines and Technical Surveys. Mines Branch.
RADIOISOTOPE ADSORPTION ON MINERALS. W. N.

Roberts. Oct. 28, 1957. 28p. (TR-147/57).

A study has been made of the adsorption of radioisotopes on zinc mineral concentrates as a function of pH and concentration. Of the isotopes tested, Cu^{64} and Ag^{110} showed better adsorption and retention by sphalerite particles than other radioisotopes. Fe^{59}, Co^{60}, Zn^{65}, Cd^{115}, and Hg^{203} were not appreciably adsorbed by sphalerite at the concentrations employed. Possible correlation between tracer adsorption and effectiveness as a flotation activator is discussed as a guide in choosing suitable isotopes. (auth)

Spectroscopy

Refer also to abstracts 7211 and 7212.

7197 AEC-tr-3156

CHANGES IN THE ABSORPTION SPECTRUM OF NITRATE ION István Hegedüs. Translated from Acta Univ. Szeged. Chem. Mineral. Phys. 7, 7-25(1939). 25p.

On the basis of studies conducted since the publication of Halban's experiments, the origin of the changes in the spectrum are subject to a novel interpretation. The present study is a further elaboration of and supplement to Halban's original experiments, its subject being the complex formation of the nitrate ion and the effects of complex-forming cations on the absorption spectrum of the nitrate ion. (A.C.)

7198 AEC-tr-3182

RAMAN SPECTRUM OF POTASSIUM CUPROCYANIDE. Paolo Chiorboli and Corrado Testa. Translated from Ann. chim. (Rome) 47, 639-45(1957). 8p.

After a brief discussion of the characteristic oscillations of the cuprocyanide ion $[Cu(CN)_4]^{3-}$, the authors report on the Raman spectrum of potassium cuprocyanide both in aqueous solution and in the crystalline state, having also determined the state of polarization of principal lines. Two very strong lines, one depolarized at 2074 cm^{-1} (class T_2), the other polarized at 2096 cm^{-1} (class A_1), correspond to the valence oscillations of the C ≡ N linkages; the first, in the spectrum of the crystalline material, is split into two components which are very close together, while the second remains unchanged as regards frequency but appears greatly depolarized. (auth)

7199

INFRARED SPECTRA OF THE ISOTOPIC NITROUS OXIDES. G. M. Begun and W. H. Fletcher (Oak Ridge National Lab., Tenn.). J. Chem. Phys. 28, 414-18(1958) Mar.

The infrared spectra of $N^{14}N^{15}O^{16}$, $N^{15}N^{14}O^{16}$, and $N^{15}N^{15}O^{16}$ have been observed from 2.5 μ to 20 μ using a model 112 Perkin-Elmer spectrometer. The frequencies of the three fundamental vibrational bands and fifteen overtone and combination bands have been tabulated and compared with the frequencies of $N^{14}N^{14}O^{16}$. Using known anharmonic constants and isotopic relations, approximate zero-order frequencies have been calculated for the isotopic molecules. A set of force constants for infinitesimal displacements have been computed for the set of molecules, and the partition function ratios for the various species calculated from the data. (auth)

7200

ABSORPTION SPECTRA OF MOLTEN SALTS. Benson R. Sundheim and Jacob Greenberg (New York Univ.). J. Chem. Phys. 28, 439-41(1958) Mar.

The ultraviolet absorption spectra of a variety of molten salts including AgCl have been determined. Generalizations about the character of such spectra are made and certain implications about the structure of the liquids are examined. (auth)

7201

THE SPECTROCHEMISTRY OF ACTINIUM. William F. Meggers (National Bureau of Standards, Washington). Spectrochim. Acta 10, 195-200(1957) Dec.

For spectrochemical detection or determination of actinium the wavelengths and estimated relative intensities (100 or greater) of 109 strong lines are presented. The wavelengths range from 2558.08 to 7866.10 A. Thirty-two lines are characteristic of Ac I, 63 belong to Ac II, 7 are assigned to Ac III, 2 possibly to Ac IV, and 5 to Ac0. The energy levels involved in the production of lines in the first three spectra of actinium are given. Within the range of these observations the strongest Ac I line is the transition $6d7s^2\ ^2D_{1.5}-6d7s(a^3D)7p\ ^2F^0_{2.5}$ with wavelength 4179.98 A and intensity 1000 in the arc or hollow cathode. The strongest line of Ac II appears to be $6d7s\ ^3D_3-7s(^2S)7p\ ^3P^0_2$ with wavelength 4088.44 A, and intensity 3000 in the spark. The strongest observed line has a wavelength 2626.44 A, and intensity 5000 in the spark; it represents the transition $7s\ ^2S_{0.5}-7p\ ^2P^0_{1.5}$ in Ac III, and must be regarded as the ultimate in high-voltage condensed electrical discharges. (auth)

7202

PROCEEDINGS OF THE COLLOQUIUM SPECTROSCOPICUM INTERNATIONALE VI, HELD AT AMSTERDAM IN MAY 1956. W. van Tongeren and F. Freese, eds. Spectrochim. Acta Suppl. 1-663(1957).

The papers or their abstracts presented at the sixth international conference are given. The topics include flame spectroscopy, emission spectrometry, arc emission, spark emission, emission (general), instrumentation (emission), instrumentation of absorption methods, ultra-violet absorptiometry, and infrared spectroscopy. (J.S.R.)

Syntheses

7203 NP-6642

Brooklyn. Polytechnic Inst.

RESEARCH AND DEVELOPMENT ON ORIENTED POLYMERS FOR RADIATION RESISTANT APPLICATION. Quarterly Progress Report. C. G. Overberger, F. M. Beringer, A. Borchert, E. Davidson, H. M. Gladstone, J. E. Mulvaney, and Eli M. Pearce. Mar. 1958. 34p. Project No. 7-(8-7340). Contract AF33(616)-5253.

The preparation of a number of polyvinyl cycloalkanes is presented. The preparation of polymers containing the trifluoromethyl group and the polymerization of small-ring olefins are discussed. Heterogeneous alkali metal initiated polymerization is also discussed. (For preceding period see NP-6517.) (W.L.H.)

Tracer Applications

7204

TRITIUM AS A TOOL IN INDUSTRIAL AND CHEMICAL RESEARCH. V. G. Braun, L. Kaplan, A. R. Van Dyken, and K. Ye. Vil'tsbakh. p. 94-112 in "Symposium on the Application of Radioactive Isotopes in Industry, Medicine, and Agriculture." Moscow, Publishing House of the Academy of Sciences, USSR, 1956.

Tritium has a number of advantages over D and C^{14} as a tracer: a higher activity, ease of introduction into molecules, low cost. Its drawback consists in the radioactive decomposition of tritium-tagged compounds. For purposes of analysis the compounds containing T are converted to a mixture of CH_4 and H_2, the activity of which is measured in an ionization chamber. The tritium-tagged compounds

are prepared by reduction with the hydrides of Li–B, Li–Al, and Na–B, which contain T. Another method consists in the neutron irradiation of the respective compounds in the presence of the lithium salt. The tritium formed by the $Li^6(n,\alpha)$ reaction enters the organic molecules. Data are presented on the activating effect of various groups, maximum specific activities, etc. Tritium-tagged methyl groups were used in the methylation of hydrocarbons for the purpose of investigating their structure. A series of data are presented on the fractionation of the T and H isotopes by partition chromatography and on the effect of the isotope composition of hydrogen on the rate of some reactions. (auth)

Transuranic Elements and Compounds

7205

ABSORPTION SPECTRA OF CRYSTALS OF PLUTONIUM SALTS. A. M. Leontovich. Optika i Spektroskopiya 2, No. 6, 695-703(1957).

The following substances were studied: (1) salts of quadrivalent plutonium: sulfate $Pu(SO_4)_2 \cdot 4H_2O$, nitrate $Pu(NO_3)_4 \cdot (1 \text{ to } 2)H_2O$, chloride (exact composition unknown) and trichloracetate with lanthanum $PuLa(CCl_3COO)_7$, (2) double sulfate of trivalent plutonium with potassium $KPu(SO_4)_2 \cdot 5H_2O$, and (3) salts of hexavalent plutonium: plutonyl perchlorate $PuO_2(ClO_4)_2 \cdot xH_2O$ and plutonyl chloride $PuO_2Cl_2 \cdot xH_2O$. The dimensions of the crystals of the substances studied were from 0.03 to 0.5 mm. Measurements were carried out at temperatures from + 20 to −170°C. The spectra are tabulated. (TCO)

Uranium and Uranium Compounds

Refer also to abstracts 7152 and 7153.

7206 CF-57-9-63

Oak Ridge National Lab., Tenn.

URANIUM TETRAFLUORIDE PRECIPITATION STUDIES. Spring Quarter, 1957 Co-op Report. K. J. Fritz. Sept. 30, 1957. 28p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A study was made of uranium tetrafluoride hydrates precipitated from uranium tetrachloride solution with hydrofluoric acid. Two hydrates were found and photographed. Fifteen batch precipitations were made varying the concentrations of reactants, the temperature, the time allowed for reaction, and the washing time of the precipitate. Uranium tetrafluoride may be precipitated from uranium tetrachloride solution with 60% technical grade hydrofluoric acid. The resulting salt is generally a flocculant, rather sticky, substance which is hard to wash and has a low bulk density. Two hydrates of uranium tetrafluoride were found: $UF_4 \cdot {}^3/_4 H_2O$ and $UF_4 \cdot 2.5 H_2O$. The $UF_4 \cdot {}^3/_4 H_2O$ hydrate is amorphous or formed of very small crystals ($\sim 4 \times 10^{-6}$ cm in diameter). In contrast the $UF_4 \cdot 2.5 H_2O$ hydrate forms rod-like crystals of about 2.5×10^{-2} cm in length. Fifteen batch precipitations of $UF_4 \cdot XH_2O$ from UCl_4 solutions were made. The ratio of acid to U^{4+} in solution was varied from 100% excess to less than stoichiometric. Temperature ranged from 25 to 105°C. (auth)

7207 HW-46685

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

A KINETIC STUDY OF THE REDUCTION OF URANIUM OXIDES WITH HYDROGEN. W. R. DeHollander. Nov. 8, 1956. 35p. Contract W-31-109-Eng-52. $1.00(OTS).

Data and a theoretical analysis are presented which demonstrate that the reduction of uranium oxides with hydrogen is essentially a zero order reaction with regard to the fraction remaining to be reduced. (auth)

7208 LA-2159

Los Alamos Scientific Lab., N. Mex.

THE SOLID SOLUBILITY OF URANIUM MONOCARBIDE AND ZIRCONIUM CARBIDE. Willard G. Witteman, James M. Leitnaker, and Melvin G. Bowman. Oct. 15, 1957. 15p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

Previous investigators have shown that the binary systems involving the monocarbides of zirconium, niobium, tantalum, titanium, and vanadium are of the solid solution type, with the exception of ZrC–VC which are almost completely insoluble in each other. In the present study it is shown that the monocarbides of uranium and zirconium are also soluble in each other and the variation of lattice parameter of the solid solution with composition conforms closely to Vegard's law. (auth)

7209 WASH-296

Division of Research, AEC.

URANIUM ALLOY NEWSLETTER NO. 14. [Edward Epremian, ed.]. Mar. 1956. Decl. Mar. 6, 1957. 62p. $0.50(OTS).

Ames Lab. Studies of Nb–U alloys, phase studies of the U–Zn system and the solubility of U in Zn, are summarized. Argonne National Lab. Phase studies of C–U systems and Nb–U alloys, the effects of radiation on Mo–U alloys, corrosion and irradiation of Si–U systems and Nb–U–Zr alloys are reported. Battelle Memorial Inst. The stability and existence range of the intermediate epsilon phase, heat treatment, and radiation damage of U–Zr alloys were investigated. A study of the physical properties of Mo–U alloys, U alloys for slug-type fuel elements, low-melting U alloys for reactor fuels is presented. The preparation of Al–U alloys is outlined, and corrosion studies of U–Zr alloys were made. Hanford Atomic Products Operation. A series of experiments covering the testing of irradiated U alloys and the transformation kinetics of Si–U systems were initiated. Knolls Atomic Power Lab. Irradiation stability and the equilibrium phase diagram of U–Zr alloys, and fission gas diffusion in Al–U alloys are being investigated. National Bureau of Standards. A brief summary of the work on Pt–U alloys is given. Nuclear Metals, Inc. Cladding of unalloyed U with either Zr or zircaloy by coextrusion and the preparation of Si–U systems were reported. Sylvania Electric Products, Inc. The preparation of enriched Mo–U alloys, investigation of the fabrication of epsilonized Si–U system by powder metallurgy and corrosion rates in 600°F water are being studied. Westinghouse Atomic Power Division. Study of powder films of diffusion areas in Zr clad-U_3Si, preparation of fuel elements by brazing extruded rods of Si–U inside zircaloy tubes, mechanism of corrosion of unclad U_3Si, radiation of Mo–U alloys, and Mo–U phase diagrams are reported. Atomics International (NAA). Results of thermal cycling as cast U alloy slugs are presented. (J.E.D.)

7210

PREPARATION OF METALLIC URANIUM. J. Maly, V. Machacek, J. Kutzendorfer, V. Kourim, and V. Jerabek (Inst. of Nuclear Physics, Prague). Jaderna Energie 4, No. 1, 9-18(1958) Jan. (In Czech.)

Experiments on laboratory preparation of metallic uranium are reviewed, and the method most suitable to Czechoslovakian economics is presented. The chosen process consisted of the extraction of concentrated solutions of $UO_2(NO_3)_2 \cdot 6H_2O$ with ethyl ether and re-extraction with water. Uranium is then precipitated as $UO_4 \cdot 2H_2O$ and

burned to UO_3, which is in turn reduced by hydrogen to UO_2 and changed by a dry process (over NH_4UF_5) to UF_4. With the aid of very pure Ca in a crucible lined with pure CaF_2 the UF_4 undergoes calcinothermic reduction to uranium metal. (tr-auth)

7211
LUMINESCENCE SPECTRA OF COMPLEX URANYL COMPOUNDS. I. L. V. Volodko and A. N. Sevchenko. Optika i Spektroscopiya 4, 40-6(1958) Jan. (In Russian)

Complex salts of uranyl nitrate with diethyl ether, ethyl acetate, acetone, nitromethane, and methyl alcohol were obtained, as well as the uranyl acetate with methyl, ethyl, and isoamyl alcohol in the crystalline lattice. Their luminescence spectra were studied. (tr-auth)

7212
LUMINESCENCE SPECTRA OF COMPLEX URANYL COMPOUNDS. II. L. V. Volodko and A. N. Sevchenko. Optika i Spektroscopiya 4, 47-54(1958) Jan. (In Russian)

Effects of the chemical nature of molecules formed in the crystalline lattice of uranyl salts on the uranyl nitrate and uranyl acetate luminescence spectra were studied. It is shown that the electron transition frequencies and the ion vibration frequencies of uranyl ion depend on the nature of the molecules interacting with it. The fine spectral structures observed at low temperatures are the result of transitions between the energy levels, and only a small portion of the lines could be produced by the transitions between the electron vibration levels of the uranyl ion. (tr-auth)

7213
EXTRACTIVE METALLURGY OF URANIUM. Alberto Cacciari. pp. 379-91 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The extraction of uranium from its ores and minerals is discussed from the aspect of production costs. The necessity for high purity in the final product is stressed. (J.S.R.)

7214
PHYSICO-CHEMICAL METHODS OF CONTROL OF PRODUCTION OF URANIUM. A. P. Vinogradov. Issledovaniya Oblast. Geol. Khim. i Met. M., Izd-vo Akad. Nauk S.S.S.R. 72-89(1955). (Translated from Referat. Zhur. Fiz. No. 3, 1957, abstract No. 7948)

A survey of methods for analyzing U as applied to its manufacture control is given. A brief description is given for the spectral methods of quantitative determination of impurities in U; the determination of small quantities of U in rocks, ores, and semi-finished articles; method of isotopic addition in the spectral determination of U in ores and semi-finished products; x-ray spectral method of determining U and of its impurities; and polarographic determination of U. (tr-auth)

Waste Disposal

7215 KAPL-1721
Knolls Atomic Power Lab., Schenectady, N. Y.
ELECTROLYTIC RECYCLE METHOD FOR THE TREATMENT OF RADIOACTIVE NITRIC ACID WASTE. A Status Report at the Termination of the Project at KAPL. H. W. Alter, D. L. Barney, J. K. Davidson, A. C. Schafer, Jr., and F. J. Witt. June 26, 1957. 81p. Contract W-31-109-Eng-52. $2.00(OTS).

A method is described for the treatment of radioactive neutralized nitric acid waste solutions. The process consists of electrolysis of sodium nitrate solutions and recycle of the caustic formed to neutralize incoming nitric acid waste. Removal of a large fraction of the bulk inert substances by this method allows greater reductions in waste volume than conventional treatment by evaporation alone. Process chemistry studies show that a large fraction of the nitrate ion in alkaline solution can be electrolytically reduced to gaseous nitrogen reduction products at reasonable current efficiencies. Process engineering studies have resulted in the development of a prediction equation for the design of electrolysis cells used in the process. Pilot plant studies using "cold" nitric acid waste have demonstrated the feasibility of the electrolytic recycle method. A preliminary cost estimate was performed which indicates a cost of from $2.75 to $2.95 per initial gallon of waste processed. Basis for this estimate is a conceptual design of a plant capable of handling the high-level waste produced in reprocessing one ton of uranium metal per day. These costs are considered reasonable in a nuclear power economy, and indications are that ultimate disposal of the concentrated waste in clay may be possible. (auth)

7216 TID-7550
Division of Reactor Development, AEC.
REPORT OF WORKING MEETING ON FIXATION OF RADIOACTIVITY IN STABLE, SOLID MEDIA AT THE JOHNS HOPKINS UNIVERSITY, JUNE 19-21, 1957. James M. Morgan, Jr. 112p. $2.50(OTS).

Papers were presented at the meeting on the following subjects: waste characteristics governing fixation in soils; chemical processing of the alumina fluid calciner product into alumina silicates; fixation of fission products in stable compounds; résumé of ceramic section of Oak Ridge National Laboratory; fixation of fission products in ceramic glazes; fission product disposal in glass; leaching studies on fired clays containing radionuclides; evaluation of experimental clinkers; fixation of active wastes in solid form using natural soils as media for glass formation; separation of cesium and strontium from calcined metal oxides as a process in disposal of high level wastes; fixation of radioisotopes on Hanford type soils; tests of stability; calcination of aqueous reactor fuel wastes in a fluidized bed; experiments on fluidized bed calcination of Idaho Chemical Processing Plant wastes using radioactive feed material; ball kiln calcination of alloy fuel element wastes; incorporation of fission products into glass; ultimate disposal of long-lived fission products; high-temperature gas cleaning problems; heat evolution and dissipation; problems associated with waste calcination schemes; sintering of reactor wastes; problems associated with the formation of ceramic clinkers; and storage of reactor fuel wastes in salt formations. (W.L.H.)

ENGINEERING

7217
GLOVEBOX FOR WORK WITH RADIOACTIVE MATERIAL. H. Dreiheller and E. H. Graul (Philipps-Universität, Marburg/Lahn, Germany). Atompraxis 4, 52-3(1958). (In German)

A description is given of a specially constructed glovebox which can be used as a closed system for work with dangerous radioactive isotopes, and which offers protection against incorporation and β radiation. The glovebox is made of 10 mm-thick transparent plastic, and is accessible from the front and rear with gloves. It can also be used advantageously for work under protective gas atmosphere. (tr-auth)

7218
GRAPHITE SEALS FOR ROTATING SHAFTS. L. A. Plutalova. Vestnik Mashinostroyeniya No. 2, 3-8(1957).

When rubber and other soft seals are inapplicable, especially in the presence of corrosive fluids, polytetrafluorethylene ("fluon") seals are sometimes used. Its low heat conduction restricts its use to low speeds, pressures and temperatures and the presence of liquid in the clearance. In many critical applications graphite seals are used. The manufacture, advantages, and drawbacks of graphite are discussed. Only two basic types of graphite are made in the Soviet Union compared with dozens of variants in the U.S.A. One type is stronger but less heat-conductive than the second type. Their permissible pressures are 35 and 25 kg/cm^2 and their maximum velocities are 20 and 40 m/sec, respectively. Both have a dry friction coefficient of about 0.045. Their rate of wear varies between 0.03 and 0.3 μ/hour and greatly rises in the presence of liquids. The design of ring seal elements held by enveloping coil springs is discussed as well as the design of face seals loaded by bellows spring units. Laboratory rig tests to determine the sealing capacity are reported, wherein liquid under pressure is supplied to a ring chamber around a rotating shaft between two seals. Leakage of water gaseous or liquid nitrogen is plotted against the fluid pressure and the rotational speed. Leakage increases with pressure. Nitrogen gas leaks more through a sectional seal with clearances at the joints; liquid nitrogen leaks more when the clearance is at the shaft. Face seals are better at high pressure. Water leaks less than liquid nitrogen. The effect of shaft speed is small, but higher speed reduces the leakage. (TCO)

Heat Transfer and Fluid Flow

Refer also to abstract 7500.

7219 CF-55-5-175
Oak Ridge National Lab., Tenn.
PERMISSIBLE RATE OF TEMPERATURE RISE OF SHELLS. B. L. Greenstreet and A. S. Thompson. May 26, 1955. 6p. Contract [W]-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

7220 HW-53598
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
THERMAL CONTACT CONDUCTANCE. R. G. Wheeler. Nov. 13, 1957. 13p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

Thermal contact conductance literature is reviewed with particular concern about those data that could apply to reactor fuel elements. Contact conductance values for a number of metal couples are plotted as a function of pressure on the joint so that comparison between the results of the various experiments can be made in consistent units. The use of formulas relating contact conductance to pressure on the joint, hardness of the metals, number of points in actual metallic contact, and the average radius of these contact points is discussed. An observed dependence of thermal contact coefficient on direction of heat flow through joints between dissimilar metals is reported. A theory explaining this effect is proposed. (auth)

7221 M-5219(Pt. 2)
Flader (Fredric) Inc., North Tonawanda, N. Y.
ONE KILOWATT STATIONARY GROUND POWER PLANT. PART II. J. Overmeyer, R. Mould, and F. Bond. June 12, 1952. Decl. July 5, 1957. 34p. Contract AT(11-1)-199. (FF-180-R6(Pt. 2)). $6.30(ph OTS); $3.00(mf OTS).

The thermodynamics of steam and mercury vapor turbine power plants was investigated for applicability to a one kw nuclear power plant. The mercury vapor cycle appears more suitable for the proposed plant from the standpoint of long-period reliable unattended operation. A turbine design is proposed. (D.E.B.)

7222
HEAT TRANSFER BETWEEN FLUIDIZED-SOLIDS BEDS AND BOUNDARY SURFACES, CORRELATION OF DATA. Leonard Wender and George T. Cooper (M. W. Kellogg Co., New York). A.I.Ch.E. Journal 4, 15-23(1958) Mar.

A broad empirical study of nine independent sets of data on fluidized-bed heat transfer is presented, with correlation of the data in two groups. A wide range of the many variables is covered, and some data on commercial units are included. Data for external (i.e., walls of the fluidizing vessel) and internal (i.e., tubes in the bed) heat transfer surfaces are correlated graphically. The correlations indicate the importance of heat transport by the mobile particles and of unsteady state conduction in the gas. (auth)

7223
CONTROL OF FLOW DISTRIBUTION BY MIXING HEADERS. Seymour C. Hyman, Alan R. Gruber, and Leon Joseph (Nuclear Development Corp. of America, White Plains, N. Y.). A.I.Ch.E. Journal 4, 33-6(1958) Mar.

The coolant flow distribution among parallel passages in a nuclear reactor (or boiler or heat exchanger) can be very sensitive to variations in heat input, channel dimensions, etc. In a previous paper this flow sensitivity was defined in terms of certain partial derivatives, which were related by analytical expressions to fluid properties and operating characteristics. Flow sensitivity contributes largely to potential malfunction, reduced efficiency, or failures. The use of valves and orifices was quantitatively evaluated for supercritical water in the earlier paper. The scope of this paper is to consider the utility of mixing headers. These mixing chambers are located along the flow passage as a common receiver for parallel flow from many channels. The headers, in turn, supply subsequent lengths of heated passages in parallel. Analytical expressions are derived for the effect of headers on flow, outlet-fluid enthalpy, and channel-wall temperatures. The limiting cases of minimum and complete mixing the headers are considered and numerical results for water at supercritical pressures are given to show the marked increase in stability obtained by use of intermediate mixing headers. (auth)

7224
A NEW ELECTRIC ANALOGUE MODEL FOR NONSTEADY STATE FLOW PROBLEMS. Irving Fatt (California Research Corp., La Habra). A.I.Ch.E. Journal 4, 49-52(1958) Mar.

A new, simple electric analogue model is demonstrated which gives solutions, accurate within ten percent, to problems in nonsteady state flow of heat, diffusion, and flow of liquids in porous media. The analogue consists essentially of a sandwhich of electrical conducting paper, polyethylene or polyester sheeting, and metal foil. One- or two-dimensional problems can be treated. This analogue provides a medium with distributed resistance and capacitance rather than the finite steps of conventional analogues; therefore two-dimensional problems of complex shape can easily be modeled. The analogue is pulsed by a square wave generator and the transient potential response is displayed on a cathode-ray oscilloscope. (auth)

7225
HEAT AND MOMENTUM TRANSFER IN THE FLOW OF GASES THROUGH PACKED BEDS. Marvin B. Glaser and

George Thodos (Northwestern Univ., Evanston, Ill.). A.I.Ch.E. Journal 4, 63-8(1958) Mar.

Heat and momentum transfer studies have been made for the flow of gases through fixed beds consisting of randomly packed, solid metallic particles. The experimental technique employed in these studies made possible for the first time the procurement of gas-film heat transfer data under steady state conditions and in the absence of mass transfer effects. Electric current passed through the metallic particles of the bed created within the particles a steady generation of heat, which was continuously removed by gases flowing through the bed. Several direct temperature measurements of both gases and solids within the bed made possible the direct calculation of the heat transfer coefficient for the gas film to produce the Colburn heat transfer factor j_h, which has been found to correlate with the modified Reynolds number, $Re_h = \sqrt{A_p}G/[\mu(1-\epsilon)\varphi]$. The shape factor φ was established in these studies for cubes and cylinders and was found to be identical to their respective sphericities. Pressure-drop measurements produced a friction factor f_k of the Blake type, which yielded separate curves for each shape when correlated with the modified Reynolds number Re_m. No simple relationship was found to exist between the heat transfer and friction factors. A single correlation of the pressure-drop data was obtained for the modulus $f_{k_0}\varphi^n$ when correlated with a Reynolds number of the type $Re_m = \sqrt{A_p}G/[\mu(1-\epsilon)]$. The exponent n varies with the particle shape. Experimental runs have been carried out for 3/16, 1/4, 5/16-in. spheres, 1/4 and 3/8-in. cubes, and regular cylinders using hydrogen and carbon dioxide to extend the range of molecular weights beyond that of air, used for the majority of these runs. A particle-size, column-diameter effect was found to exist for both heat and momentum transfer. This effect becomes significant in the low Reynolds region. (auth)

7226

FLUID-PARTICLE HEAT TRANSFER IN PACKED BEDS. Ernest B. Baumeister and C. O. Bennett (Purdue Univ., Lafayette, Ind.). A.I.Ch.E. Journal 4, 69-74(1958) Mar.

Steady state heat transfer experiments were carried out in a 4-in. I.D. transite tube packed with 3/8-, 1/4-, and 5/32-in. steel spheres. Heat was generated in the pellets by means of a high-frequency induction coil surrounding the test section. Average heat transfer coefficients between the bed of spheres and a stream of air passing through the bed were calculated for Reynolds numbers of from 200 to 10,400. To ensure the reproducibility of the data, the bed was repacked six times for each pellet size. A study of the effect of the tube-to-pellet-diameter ratio indicates that this effect is large for low values of the ratio, but much smaller for higher ratios. The results are presented both graphically and in terms of empirical equations. The analogies among heat, mass, and momentum transfer are discussed, and it was found that no simple relation between the heat transfer coefficient and the friction factor exists for packed beds with a gas as the fluid. An attempt is made to predict the heat transfer rates for packed beds from heat transfer data for single spheres and from pressure-drop measurements for the packed bed; however, the rates predicted from the pressure-drop measurements are somewhat lower than the experimental results. (auth)

7227

NATURAL-CONVECTION HEAT TRANSFER IN REGIONS OF MAXIMUM FLUID DENSITY. R. S. Schechter (Univ. of Texas, Austin) and H. S. Isbin (Univ. of Minnesota, Minneapolis). A.I.Ch.E. Journal 4, 81-9(1958) Mar.

One of the important factors affecting the rate of heat transfer by natural convection is the temperature-density relationship of the convecting fluid. The importance of this factor is amplified when the heat is being transferred to a medium which has a maximum density. This investigation consisted of measuring the heat transfer rates, velocity gradients, and temperature profiles when heat is transferred from a flat vertical plate to water in the region of 4°C. In some experiments the flow in the boundary layer was observed to be downward while at other conditions of plate and fluid temperature a dual motion (both up and down) was noted, thus establishing a basic difference in the heat transfer mechanism and precluding a unified theory. Theoretical consideration is given to each mechanism and a criterion is derived to predict the flow regime which will prevail at fixed conditions of plate and bulk temperatures. An analogue computer was used to establish theoretical velocity and temperature profiles. The theoretical values agree reasonably well with the measured values; however, the experimental temperature gradients near the wall were not sufficiently accurate to be extrapolated to determine a point heat transfer coefficient. (auth)

7228

RATES OF FLOW THROUGH MICROPOROUS SOLIDS. E. R. Gilliland, R. F. Baddour, and J. L. Russell (Massachusetts Inst. of Tech., Cambridge). A.I.Ch.E. Journal 4, 90-6(1958) Mar.

Rates of flow of pure gases, both those with no adsorption and those with appreciable adsorption, were studied as a function of pressure level, pressure drop, and temperature for flow through 1/2-in.-diameter cylindrical plugs of activated carbon and of unsintered Vycor glass. Adsorption isotherms for the pure gases on Vycor glass were measured over the range of variables covered in the flow studies. Permeabilities, which are proportional to the rate of flow per unit of pressure drop, were satisfactorily correlated for hydrogen, helium, argon, and nitrogen by employing existing gas-phase flow theory. Permeabilities considerably larger than the values predicted from the nonadsorbed gas correlation, sometimes more than seventeen times as large, were observed for ethylene, propylene, and isobutane flowing through a Vycor plug. For the hydrocarbon-Vycor systems, permeabilities for vapor flow are as much as sixty times larger than for bulk liquid flow. The unusual flow phenomena for the hydrocarbon-Vycor systems are attributed to a rapid transport in the adsorbed layer. The total transport is treated as being the sum of gas-phase and adsorbed-layer flow. An equation describing adsorbed-layer movement is derived by utilizing a force balance together with thermodynamic principles. The resulting equation has just one empirical constant, and its use requires adsorption-isotherm data. It correlates very well the surface flow rates for the major range of the variables covered in this investigation. Rate measurements were made for adsorbed-layer concentrations ranging from about one tenth of a monolayer up through the capillary condensation region. Deviations in the one constant form of the equation are observed below one tenth of a monolayer. The available literature data on flow in adsorbed layers are reasonably well correlated by the same equation. (auth)

7229

FILM-PENETRATION MODEL FOR MASS AND HEAT TRANSFER. H. L. Toor and J. M. Marchello (Carnegie Inst. of Tech., Pittsburgh). A.I.Ch.E. Journal 4, 97-101 (1958) Mar.

The two major models of the mechanism of mass and heat transfer between two phases are the film theory and penetration theory; these are not unrelated concepts, but are limiting cases of a more general model. Quantitative transfer to old, intermediate, and young elements is dis-

cussed, along with mathematical development and curves. (J.R.D.)

7230

LONGITUDINAL DISPERSION IN A PACKED BED. J. M. Prausnitz (Univ. of California, Berkeley). A.I.Ch.E. Journal 4, 14M, 22M(1958) Mar.

A mixing length model for longitudional dispersion is developed to provide insight into the fundamental difference between axial and radial mixing. (J.R.D.)

7231

GAS-CIRCULATION PROBLEMS IN REACTOR DEVELOPMENT. J. R. Ridley. G.E.C. Atomic Energy Rev. 1, 160-5(1958) Mar.

A brief account is given of the arrangement of the gas-circulator system for the Hunterston reactors, and of the considerations that led to that particular design. Experimental work on a one-third-scale model of the blower is described, and a typical characteristic illustrated. Different types of shaft seal are discussed, and experiments with two of them—the carbon face seal and the viscous oil seal—are described. (auth)

7232

HEAT CONDUCTIVITY OF INDUSTRIAL MATERIALS. Moscow, Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, 1957. 165p.

The book contains data on the heat conductivity of solid materials, liquids, and gases over a wide range of temperatures. Specific weight, heat capacities and other thermophysical characteristics are given for numerous substances. Basic concepts of the mechanics of heat conductivity processes and the relationship between heat conductivity coefficients and material and temperature, as well as short descriptions of methods for determining the heat conductivity coefficient for various substances, are also presented. (TCO)

Pumps

7233 CF-58-2-25

Oak Ridge National Lab., Tenn.

GAS SATURATED RUN ON THE 400A-1 PUMP. H. R. Payne. Feb. 10, 1958. 10p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A 1585 hr run was completed on the 400A-1 pump with a 0.4 m UO_2SO_4 fuel solution as the pumped fluid, during which it was attempted to operate with gas bubbles in the solution. The gas content ranged from 0.56 ml/gm of solution to 1.189 ml/gm of solution and the gas other than CO_2, which was assumed to be nitrogen, varied from 0.39 ml/gm of solution to 0.966 ml/gm of solution. Because of uncertainties in the CO_2 solubility it cannot be stated conclusively that the liquid was or was not saturated. However, the loss of metal at a number of places due to corrosion and/or gas bubble erosion makes it advisable not to operate a pump of this exact design at or near gas saturation. The 1585 hr above are the last of 13185 hrs maintenance free operation. A general examination of the pump disclosed severe corrosion and softening of the Stellite 12 overlay on the 347 stainless steel thrust bearing shoes. The thermal barrier seal weld had cracked and there was noticeable corrosion in the region between the thermal barrier gasket and metallic "O" ring seal. (auth)

Vacuum Systems

7234 MLM-1015

Mound Lab., Miamisburg, Ohio.

A GLASS–METAL VACUUM SYSTEM. (Information Report). George L. Fox and Ernest Paige. Oct. 25, 1954. 9p. Contract AT-33-1-GEN-53. $0.50(OTS).

The equipment described illustrates novel principles for the design of systems for performing a sequence of operations in a vacuum and/or in controlled atomspheres. It automatically provides an effective barrier to prevent the spread of contamination. It features small reaction volumes, the use of simple manipulators which require only translation and rotation, and ready adaptability to remote control. These systems have advantages of relatively low cost, simplicity of movements, and easy replacement of components. (auth)

Waste Disposal

7235 HW-49543 A

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

THE RETENTION OF HIGH LEVEL RADIOACTIVE WASTES. A. M. Platt. Apr. 18, 1957. 27p. Contract W-31-109-Eng-52. $1.00(OTS).

The operating experience of prime contractors for the United States Atomic Energy Commission in the retention of radioactive wastes by underground tank storage, waste scavenging, and ground disposal techniques is briefly described. Some of the engineering, economic, and biological hazard aspects of these operations are discussed. (auth)

7236 HW-54721

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

DISPOSAL OF RADIOACTIVE LIQUID WASTES FROM THE URANIUM RECOVERY PLANT. D. W. Rhodes and J. L. Nelson. June 3, 1957. 34p. Contract W-31-109-Eng-52. $1.00(OTS).

A series of laboratory experiments was conducted to estimate disposal volumes for Uranium Recovery Plant (URP) scavenged wastes. The disposal volume was considered to be the maximum volume of waste that could be discharged to a specific disposal site such that no radioisotope with a half-life greater than three years reached the ground water in concentrations greater than one-tenth of the maximum permissible concentration for that radioisotope in drinking water. The results of laboratory equilibrium and soil column tests with synthetic and actual process wastes are presented. Methods used to estimate disposal volumes from the experimental data are largely empirical and in many cases were influenced by operational experiences in the past. The data are considered applicable only to the particular soil-waste liquid system studied in this investigation. (auth)

7237 TID-8017

Technical Information Service, AEC.

RADIOACTIVE WASTE DISPOSAL AT KNOLLS ATOMIC POWER LABORATORY. D. A. Manieri and W. H. Truran. Knolls Atomic Power Lab. Mar. 1958. 17p. $0.50(OTS).

One of Its Monograph Series "The Industrial Atom."

Disposal of radioactive wastes from KAPL is considered with respect to the three physical categories of waste—solid, liquid, and airborne—and the three environmental recipients—ground, surface water, and atmosphere. Solid waste-handling includes monitoring radiation levels, segregation, collection, processing, packaging, storing if necessary, and shipping to a remote burial ground at the Oak Ridge National Laboratory. Liquid waste is collected by controlled drain systems, monitored for radioactivity content, and stored if necessary or released to the Mohawk River. Exhaust air is cleaned before released and con-

tinuously monitored. The environment is monitored to assure safe and proper disposal of wastes. The cost of operations and the depreciation of facilities incurred by KAPL for disposing of radioactive contaminated waste is less than 0.7% per year of the total cost of the Laboratory. (auth)

7238 WAPD-SFR-PD-105

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

CRUD ABSORPTION BY ION EXCHANGE RESINS. G. P. Simon and W. J. Singley. [May 1956.] 13p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The results of investigations to determine effects of crud absorption on demineralizer life are presented. The tests consisted of contacting known amounts of ion exchange resin; either hydrogen form cation, hydroxyl form anion, or mixed bed hydrogen-hydroxyl, with known amounts of synthetic crud for periods up to 10 weeks. On the basis of results from these tests, it was concluded that no serious problem exists as a result of crud absorption by mixed bed resins. Resin capacity losses for crud concentrations encountered to date in mixed bed resins would be less than 5% of the total capacity. Since design life calculations for demineralizer are probably inaccurate by at least 5 to 10%, it is recommended that no allowances, for crud absorption, be made in the demineralizer size unless crud concentrations in excess of 5g per 100 ml of cation resin are expected to be found in the ion exchange resin bed. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

Ceramics and Refractories

7239 SC-3859(TR)

Clevite Research Center, Cleveland.

PROPERTIES OF SOLID SOLUTIONS OF LEAD TITANATE-LEAD ZIRCONATE. Technical Report No. 2. Don Berlincourt. Aug. 1956. 65p. For Sandia Corp. Contract [AT(29-1)-789]. $12.30(ph OTS); $4.50(mf OTS).

This report summarizes the work done by the Clevite Research Center for Sandia Corporation on the new piezoelectric ceramic system—lead zirconate-titanate. The effects of various methods of polarization, temperature, strontium additions, aging, and high axial compressions on the piezoelectric properties of the material are presented. Pyroelectric studies have also been made. (auth)

7240

THORIA-URANIA BODIES AND IRRADIATION STUDIES. C. L. Hoenig, J. H. Handwerk, J. H. Kittel, and C. R. Breden (Argonne National Lab., Lemont, Ill.). J. Am. Ceram. Soc. 41, 117-23(1958) Apr.

Thoria–urania fuels were irradiated bare and clad in metal jackets of stainless steel, Zircaloy-II, and aluminum–1 weight % nickel alloy. These specimens were irradiated in NaK (a sodium-potassium eutectic alloy) and in water. Irradiation severity was based on the total metal-atom burnup and on the surface heat flux, and the pellets were evaluated on the basis of dimensional stability, corrosion resistance, and visual analysis. The tests indicated that thoria–urania solid-solution bodies apparently are suitable for use as fuels in boiling-water reactors. (auth)

Corrosion

7241 ORNL-2156

Oak Ridge National Lab., Tenn.

CORROSION PRODUCTS FORMED IN THE REACTION BETWEEN FUSED SODIUM HYDROXIDE AND IRON-RICH ALLOYS OF IRON, CHROMIUM, AND NICKEL. G. P. Smith and E. E. Hoffman. May 14, 1957. 9p. Contract W-7405-eng-26. $0.50(OTS).

A study was made of the microstructures of corrosion-product layers formed by the action of fused sodium hydroxide at 815°C on types 304 and 347 stainless steel and on four high-purity iron–chromium–nickel alloys with nominal compositions of 80% Fe–20% Cr, 80% Fe–10% Cr–10% Ni, 74% Fe–18% Cr–8% Ni, and 60% Fe–20% Cr–20% Ni. Each corrosion-product layer was found to consist of a nonmetallic network threading through a metallic matrix and to resemble similar layers formed by the action of hydroxide melts on Inconel. (auth)

Geology and Mineralogy

7242 RMO-904

Colorado Raw Materials Office, AEC, Grand Junction.

PROGRESS REPORT ON GAMMA-RAY LOGGING ACTIVITIES. Sherman S. Comstock. July 9, 1951. 37p. $0.35 (OTS).

An evaluation is made of radioactivity logging as applied to exploration drilling on the Colorado Plateau. The compilation of data gives a preliminary insight into the possibilities of the technique being applied. A comparison has also been made of the results obtained by the logging units of the U. S. Geological Survey, The Texas Company, and the Colorado Exploration Branch. The work performed by the Commission has demonstrated that it is possible to utilize a gamma-ray log for geologic interpretation and for obtaining approximate assay values. Gamma-ray logging is a definite aid to exploratory drilling in detecting radioactivity anomalies and providing an accurate geologic log. Extensive application of this technique may reduce the over-all cost of drilling through reduction of the amount of coring required and make possible a close coordination of geologic planning with the drilling operation. Operational logging and experimentation have proved that equipment now being used by the Colorado Exploration Branch provides satisfactory operation in the following respects: provides sufficient sensitivity, gives a linear response, reproduces a log when re-runs are made in the same hole several days apart and under dissimilar weather conditions, produces a log in which the statistical fluctuations do not affect the interpretation, and has an adequate range of sensitivity scales. It has been demonstrated that a single logging unit, with provision for field maintenance, can log the total footage being drilled on a project today. It is concluded that a complete gamma-ray logging service will be a decided asset to the exploration drilling program. (auth)

7243 RMO-908

Bureau of Mines.

EVALUATION OF MONAZITE PLACER DEPOSITS. Mitchell H. Kline. Apr. 1952. 18p. $0.25(OTS).

New techniques are described which are employed for evaluation of monazite deposits. The presence of other radioactive minerals besides monazite, such as uranothorite, samarskite, euxenite, furgusonite, brannerite, xenotime, zircon, and others, make a triple check—radiometric, chemical, and mineralogic—analysis desirable. Information is given on the different methods used in

field operations, in field laboratories and in the Mt. Weather Laboratory. Churn drilling and shafting with caissons have been used as sampling techniques. Substantial reserves of monazite which will insure the domestic production of the mineral have been found by the Bureau of Mines during the last 3 years, using these methods. (J.E.D.)

7244 TEI-67

Geological Survey.

RECONNAISSANCE OF RADIOACTIVE ROCKS OF VERMONT, NEW HAMPSHIRE, CONNECTICUT, RHODE ISLAND AND SOUTHEASTERN NEW YORK. Frank A. McKeown. June 1951. 47p. $0.30(OTS).

In 1948, 7,662 miles of roadside rocks and soils in Vermont, New Hampshire, Connecticut, Rhode Island, and southeastern New York were traversed with a car-mounted Geiger-Mueller counter. The observed distribution of the abnormally radioactive rocks and soils is limited to certain areas, called "radioactive provinces," that are separated from each other by areas of essentially nonradioactive rock. These provinces and their maximum percent of equivalent uranium are: The Hudson and Housatonic Highlands of southeastern New York and western Connecticut, 0.240 equivalent uranium; Central New England, 0.006 equivalent uranium; and the Milton area of northwestern Vermont, 0.029 equivalent uranium. The distribution, form, grade, and uranium-thorium ratio of the radioactive deposits differ in each of the three provinces. Most of the radioactivity outside of the Milton area is caused by thorium. (auth)

7245

URANIUM-BEARING CONGLOMERATES OF THE BLIND-RIVER REGION IN CANADA. K. M. Atomnaya Energiya No. 2, 112-13(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3325).

7246

GOLD-URANIUM DEPOSITS IN SOUTH AFRICA. Z. A. and G. E. Atomnaya Energiya No. 2, 113-15(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3326).

7247

STUDY OF DISTRIBUTION OF RADIOACTIVITY AND OF LEAD IN CRYSTAL OF ZIRCON. Marcel Roubault and Rene Coppens. Compt. rend. 246, 137-40(1958) Jan. 6.

A systematic analysis of uranium and lead in various parts of a thick zircon crystal shows a heterogeneous distribution of these two elements and leads to determination of the age of the sample accurate to within 50 to 100%. (tr-auth)

7248

ON THE PRESENCE OF A URANYL PHOSPHATE IN A GRANULITE OF BRITTANY. Grégoire Kaplan. Compt. rend. 246, 1066-8(1958) Feb. 17. (In French)

In an abnormally radioactive granulite found at Kernevez in Plouray (Morbihan), a fluorescent complex uranyl phosphate was developed at the surface of a quartz crystal. The author attempts to contribute to the study of the geochemistry of uranium by analyzing the characteristics of the rock and of the fluorescent mineral. (tr-auth)

7249

ON GEOCHEMISTRY OF DISPERSED THORIUM AND URANIUM IN CLAYS AND CARBONATE ROCKS OF RUSSIAN PLATFORM. V. I. Baranov, A. B. Ronov, and K. G. Kinashova. Geokhimiya No. 3, 3-8(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11503)

In sedimentation processes U migrates to a considerable extent in the form of soluble compounds, whereas Th migrates in colloidal form. Magnitude of Th:U ratio is twice as large in clays as in carbonate rocks, and in the latter Th is contained in the insoluble portion. Clays of the Russian Platform contain on the average 1.1×10^{-3}% Th and 4.1×10^{-4}% U; carbonate rocks 2.4×10^{-4}% Th and 2.1×10^{-4}% U. Maximum content of Th is noted in rocks formed during periods of most intensive erosion of crystalline rocks or shell of weathering. Content of U in rocks of different composition and geological age varies to a considerably lesser extent than that of Th. A certain enrichment in U is observed in rocks having an increased content of organic substances.

7250

MARYSVALE, UTAH, URANIUM AREA. GEOLOGY, VOLCANIC RELATIONS, AND HYDROTHERMAL ALTERATION. Special Paper 64. Paul F. Kerr, Gerald P. Brophy, Harry M. Dahl, Jack Green, and Louis E. Woolard. New York, The Geological Society of America, 1957. 222p. and 10 illus.

The Marysvale district is a source of consistent uranium production where ores occur in veins related to igneous activity. Here is an unusual illustration of the nature of hydrothermal alteration in connection with vein formation. The region furnishes data on the relationship between centers of igneous invasion and the sedimentary accumulations of the Colorado Plateau. The area of uranium production lies in the vicinity of the Prospector, Freedom No. 2, Bullion Monarch, and near-by workings and constitutes a zone about a mile long by half a mile wide. Hypogene uranium occurs as pitchblende associated with black fluorite and fine pyrite in breccia and distributed veinlets along veins. Veins pinch and swell, and ore shoots are either vertical or exhibit a steep west rake. Supergene uranium minerals occur near the surface. Umohoite is a new hydrous uranium molybdate first discovered in the Freedom No. 2 mine. The mineral occurs in the ore-bearing vein along with pitchblende. This occurrence at depth and associated with pitchblende rather than the oxidized uranium-molybdenum minerals ilsemanite and jordisite suggests hypogene origin. Earlier hydrothermal alteration produced numerous masses of alunite which occur in the rocks of the Bullion Canyon volcanic series; these are mostly pyroxene andesite and tuff. Radioactivity is low in these masses. Later hydrothermal alteration is associated with the uranium-bearing veins. Clay minerals occur along vein zones which cut quartz monzonite or granite and contain mixed aggregates of kaolinite, illite, halloysite, and montmorillonite. These are cut by broken bands of silicification with pitchblende either disseminated or in streaks. Chlorite occurs along vein borders, and adularia is a vein associate. Minor alunite is a late alteration product. Clay zones extend beyond the ore-bearing portions of veins which constitute a small portion of the total length of clay veins in the area. On the other hand, ore is associated with alteration. Mount Belknap glassy rhyolite forms dikes, fills vents, and appears to be associated with diatremes. In places glassy dikes have been converted to masses of clay minerals by hydrothermal alteration. In the Bullion Monarch mine pitchblende is associated with glass, and ores occur in some of the argillitized dikes. The occurrence of uranium in late Tertiary alteration zones confirms Pb: U age determinations which place the age of Marysvale uranium at about 10,000,000 years. Rafted blocks of metamorphosed plateau sediments suspended in quartz monzonite intrusive plugs suggest that these strata underlie the exposed volcanic sequence. Several square miles of Paleozoic and Mesozoic sediments along the Deer Trail Mountain escarpment west of Marysvale indicate the character of the sediments which lie deeply buried beneath the volcanic rocks near the intrusives. The Antelope Range in which the uranium de-

posits are located lies in a graben between the Sevier fault on the east and the Tushar fault zone on the west. The graben has been disrupted north of the Tushar fault by the invasion of the Mount Belknap volcanic series. (auth)

Metals and Metallurgy

Refer also to abstract 7511.

7251 AECU-3651

Detroit Edison Co., Detroit.

METALLURGICAL EXAMINATION OF THREE URANIUM-10 WEIGHT PER CENT MOLYBDENUM FUEL RODS TO DETERMINE CONFORMANCE TO APDA SPECIFICATIONS. Engineering Lab. and Research Dept. Report 57B52-1. J. J. Bodzin. Mar. 19, 1957. 29p. Contract [AT(11-1)-476]. $4.80(ph OTS); $2.70(mf OTS).

Three fuel rods composed of uranium–10 wt. % molybdenum alloy clad with zirconium were examined to determine their conformance to APDA, Inc. specifications for fuel pins. Results of the test included dimensions, straightness, surface finish, weight, surface flaws, clad thickness, and chemical analysis. (J.E.D.)

7252 AGARD-101

North Atlantic Treaty Organization, Paris. Advisory Group for Aeronautical Research and Development.

A SURVEY OF THE STRUCTURAL PROPERTIES OF SOME HIGH STRENGTH SHEET STEELS. M. A. Melcon. Apr. 1957. 34p.

Presented at the Fifth Meeting of the Structures and Materials Panel, Apr. 24 to 27, 1957, in Oslo, Norway.

This paper deals primarily with the structural properties of the sheet steels; however, a brief strength-weight evaluation of steel, titanium, and aluminum is made for purposes of orientation. The heat-treatable stainless steels which are specifically covered are 420, 422, 422M, AM350 and 17-7PH. Tri-cent, a low alloy steel and Thermold 'J', a tool steel are also discussed. Mechanical properties at room and elevated temperature are summarized. Stress-strain curves in both tension and compression are presented at room and elevated temperature. Heat treatment, corrosion resistance, and formability of the various alloys are discussed. Some fatigue, creep, and stress-rupture data are presented. Tear strength, a property which has recently been brought into sharper focus, is evaluated for some of the materials. Fabrication problems such as welding, machining, and distortion during heat treatment are also covered. (auth)

7253 BMI-767

Battelle Memorial Inst., Columbus, Ohio.

HYDROGEN EMBRITTLEMENT OF ZIRCONIUM. R. W. Dayton, A. D. Schwope, G. T. Muehlenkamp, H. A. Saller, R. F. Dickerson, C. M. Schwartz, and M. W. Mallett. Aug. 22, 1952. Decl. Mar. 6, 1958. 36p. Contracts W-7405-eng-92 and NObs-50352. $1.00(OTS).

The amount of hydrogen normally present in zirconium and zirconium alloys suffices to reduce their ductility greatly in an impact test at room temperature, after slow cooling from 600°F. Quenching from 600°F or above gives high impact strength, as does removal of hydrogen by high-temperature vacuum annealing. The evidence on hydrogen embrittlement, the diffusion, solid solubility, and equilibrium pressure of hydrogen in zirconium, the microstructure, and the effects of hydrogen and heat treatment on the mechanical properties of zirconium are discussed. (auth)

7254 BMI-1244

Battelle Memorial Inst., Columbus, Ohio.

THE CLADDING OF DELTA-PHASE ZIRCONIUM HYDRIDE. Stan J. Paprocki, Edwin S. Hodge, and Charles B. Boyer. Dec. 27, 1957. Decl. Mar. 3, 1958. 38p. Contract W-7405-eng-92. $6.30(ph OTS); $3.00(mf OTS).

A study was made of the cladding of solid and powdered delta-phase zirconium hydride in both rod and flat shapes with stainless steel. The program included investigations of metallurgical bonding, both with and without the use of metallic barrier materials. Types 304 and 347 stainless steel were used for cladding material. The intermediate barrier-layer materials used were niobium, molybdenum, a combination of copper and molybdenum, and a combination of copper and niobium. The pressure-bonding techniques, involving the use of gas pressure at elevated temperatures, was employed in this study. Variable times and temperatures with a constant pressure of 10,000 psi were utilized to produce bonding. The best results were achieved in cladding delta-phase zirconium hydride directly with Types 304 or 347 stainless steel. Good bonds were obtained by pressure bonding at 1600°F for 3 or 4 hr subsequent to pressure bonding at 1900°F for 1 to 2 hr at a pressure of 10,000 psi. Partial bonding was achieved between niobium and zirconium hydride and molybdenum and zirconium hydride. (auth)

7255 NMI-1182

Nuclear Metals, Inc., Cambridge, Mass.

ANNUAL PROGRESS REPORT TO THE AEC RESEARCH DIVISION FOR THE PERIOD JULY 1, 1956 THROUGH JULY 1, 1957. Nov. 20, 1957. 143p. Contract AT(30-1)-1565.

Capsule preparation, irradiation, and chemical separation for the evaporation of iridium on metal surfaces are described. The effects of fast neutron irradiation on Cu–Fe precipitation-hardening alloys are summarized. The behavior of the extrusion of two-piece antimonial lead billets of varying stiffnesses was studied. The solubilities of a number of metals in molten Tl, Pb, and Bi are given. Data are given on the effect of Ca, Fe, Ni, and Cr on the tensile properties of preferentially oriented Be sheet. (W.L.H.)

7256 NMI-1198

Nuclear Metals, Inc., Cambridge, Mass.

QUARTERLY PROGRESS REPORT TO THE AEC RESEARCH DIVISION FOR THE PERIOD OCTOBER 1, 1957 THROUGH DECEMBER 31, 1957. S. Isserow, W. B. Nowak, E. J. Rapperport, W. Wegner, and A. Boltax. Jan. 10, 1958. 9p. Contract AT(30-1)-1565. $0.50(OTS).

Progress is briefly reported on the following studies: liquid metal solubilities; studies in tandem extrusion; the effect of fast neutron irradiation on precipitation hardening alloys; and deformation process in zirconium. (W.L.H.)

7257 NP-6601

Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

INVESTIGATION OF HIGH TEMPERATURE RESISTANT MATERIALS. Quarterly Report No. 10 [for] November 1, 1957 to January 31, 1958. J. D. Walton, J. D. Fleming, and C. R. Mason. 54p. Project No. A-212. Contract NOrd-15701.

Coatings. Preliminary tests were made on the effects of particle size and substrate temperature on the adherence of flame-spray coatings on mild steel using a powder containing 85% zirconia and 15% titania. Two materials, 70:30 mix of Al and Al_2O_3 and Cu, were investigated as possible base coats for flame-sprayed Al_2O_3. Thermitic Cermets. The effect of the ratio of thermite mix to throttling agent and the effect of the shrouding material used during ignition was studied in connection with zirconium disilicide thermitic cermet billets. The thermite reaction between Al and fused silica was considered as a possible means of bonding a high silica body. Cermets containing

zirconium carbide and titanium carbide were produced using thermite reactions. Rocket Nozzle Materials. Extensive tests were made on the rocket nozzle test facility to standardize operating procedures. (W.L.H.)

7258 NP-6612
Army Engineering Research and Development Labs., Fort Belvoir, Va.
CONFERENCE ON WELDING ENGINEERING [HELD AT FORT BELVOIR, VIRGINIA], APRIL 29–MAY 1, 1957. 469p.

Papers were presented at this conference on the following subjects: factors in the selection of welding processes; development of welding for engineering fabrication; survey of welding codes, standards, and specifications; general philosophy for application of welding engineering; defining quality of welding workmanship; research destructive test methods for weldability; sampling and proof testing for weld acceptance; storage and pressure vessels; welded bridges; ship structure; design of hydraulic structures; a needed re-appraisal of welding potential in building framings; engineering aspects of welding and arc cutting the aluminum alloys; hard-facing; surfacing by the thermo spray process; welding of the Army Package Power Reactor; research and experience in welded steel construction; evaluation of laboratory fatigue studies of welded structure; Canadian welding codes and their administration; European welding operations; use of steel castings in engineering weldments; considerations on the incorporation of steel castings in welded structures; the Army conservation-of-materials program and some conservation measures accomplished by welding; a new concept of welded design for improved vibration control; problems encountered by government agencies in the design, fabrication, testing, and inspection of welded material for federal-aid highway bridges; when and why does aluminum fail; service failures encountered in Navy applications; welded ship construction and radiography; effect of welding on the notch toughness of a casualty material; the fusion zone as a major weldability concept in welding of high strength steels; oil storage tank failures at Fawley, England; some problems encountered in the design, fabrication, and inspection of welded aircraft parts; defective welding in items produced by government agencies; problems encountered by government agencies in the design, fabrication, testing, and inspection of welded material, parts, or constructions produced under government procurement contracts; and nondestructive testing procedures. (W.L.H.)

7259 NP-6628
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
SELECTION OF MATERIALS FOR AIRCRAFT AUXILIARY GAS CONTAINERS. C. T. Olofson, G. E. Faulkner, H. R. Ogden, and S. A. Gordon. Dec. 6, 1957. 63p.

A preliminary evaluation was made of the suitability of titanium alloys and 17-7PH steel for constructing high-pressure auxiliary gas containers, for aircraft, to hold various gases under operating pressures of 3500 psi. The titanium alloys included commercially pure titanium, Ti–6Al–4V, Ti–5Al–2.5Sn, and Ti–4Al–4Mn. The gases under consideration are oxygen, nitrogen, air, carbon dioxide, hydrogen, and helium. The service temperatures under consideration are limited to the range of –65 to +400°F. (auth)

7260 NRL-5036
Naval Research Lab., Washington, D. C.
A COMPARISON OF THE CREEP-RUPTURE PROPERTIES OF NICKEL IN AIR AND IN VACUUM. P. Shahinian and M. R. Achter. Sept. 19, 1957. 17p. Projects NR-510-000 and NR-510-007.

In a comparison of the creep-rupture properties of nickel in air and vacuum there is a reversal in relative strengths with variations in stress. At low stresses the properties are better in air; at high stresses they are better in vacuum. In the early stages of the high stress test the specimen in air has the lower creep rate but the one in vacuum is creeping at a lower rate in the final stages. A tentative mechanism involving two competing processes is considered to explain these reversals. (auth)

7261 TID-8015
Technical Information Service, AEC.
WELDING OF INCONEL "X." K. M. Spicer and G. R. Pease, International Nickel Co., Inc. Mar. 1958. 13p. $0.50(OTS).

One of Its Monograph Series "The Industrial Atom."

Welding procedures are described whereby it has been possible to demonstrate minimum joint efficiencies of the order of 80% in ½-in.-thick Inconel X weldments. For the present, at least, these properties are attainable only by the use of the inert-gas-shielded tungsten-arc process coupled with a welding sequence which calls for vigorous cleaning of the deposited metal between passes. It is essential that welding stresses be removed by appropriate thermal treatment before aging is attempted to avoid serious cracking difficulties. (auth)

7262 TML-82(Suppl.)
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
COMPILATION OF ELEVATED-TEMPERATURE PROPERTY DATA FOR TITANIUM AND SOME ALTERNATIVE METALS. Supplement to PROPERTIES OF TITANIUM ALLOYS AT ELEVATED TEMPERATURES, September 10, 1957. Feb. 17, 1958. 169p.

A compilation is presented of elevated-temperature, short- and long-time tensile properties, creep, and physical property data thought to be useful in the selection of structural materials for missiles and aircraft. (W.L.H.)

7263 TML-96
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
DESCALING AND CLEANING OF TITANIUM AND TITANIUM ALLOYS. D. W. Stough, H. S. George, E. B. Friedl, W. K. Boyd, and F. W. Fink. Mar. 28, 1958. 64p. Contract AF18(600)-1375.

A survey of the present commercial practices for descaling titanium and titanium alloys is presented. Scales formed on titanium and titanium alloys that have been heated in air at temperatures up to about 1100°F are generally removed by acid pickle baths. More drastic treatment is usually required when the metal is heated in air to temperatures in excess of 1100°F. Titanium with scales formed above 1100°F requires treatment in a molten-salt bath, which may utilize an electric current, followed by pickling in a suitable acid solution. Proprietary descaling methods are discussed to the extent that such information is available. Other methods currently in use to clean the surface include sand, grit, and vapor blasting, and a softening treatment in aqueous caustic, similar in sequence to the molten-salt bath. Descaling practices at the major producers of mill products, such as titanium billet, bars, plate, and especially sheet, have been discussed in detail. The data are discussed generally, conclusions given, and recommendations made for further research. (auth)

7264 WADC-TR-55-87(Pt. V)
Franklin Inst. Labs. for Research and Development, Philadelphia.
TREATMENT OF METAL SURFACES FOR ADHESIVE BONDING. Period Covered: August 1956 to June 1957. Edmund Thelen, Richard Hollinger, Thomas I. Haigh, Jr.,

James B. Drew, Charles J. Varker, and Wallace E. Frank. July 16, 1957. 42p. Project title: RUBBER, PLASTIC AND COMPOSITE MATERIALS. Task title: STRUCTURAL ADHESIVES. Contract AF33(616)-2347. (AD-150998).

The scope includes analysis of strong and mild surface treatments for clad aluminum alloy, stainless steel, and titanium alloy and of the best treatment for magnesium alloy. Reaction of bonded surfaces to sand and vapor blast treatments is analyzed. The resistance of the treatments to salt spray is evaluated. Field-repair treatments are discussed and results of tests tabulated. Quality control instrumentation is outlined. Application of d-c potentials to bonded surfaces was determined to be deleterious. Radio-tracer studies using isotopic chromium provided valuable information regarding the role of chromium ions in metal surface preparation. A means of providing continuous indication of bond strength during the life of the plane is suggested. (auth)

7265 WADC-TR-57-61(Pt. II)
Clevite Research Center, Cleveland.
LUBRICATION OF TITANIUM. [Period covered] March 15, 1957 to December 15, 1957. Nicholas Fatica. Dec. 15, 1957. 85p. Project title: METALLIC MATERIALS. Task title: TITANIUM METAL AND ALLOYS. Contract AF33(616)-3350.

This investigation sought to obtain some information about the frictional properties of modified titanium coatings and to make a comparison of the wear resistance of the best surface treatments in the presence of various lubricants using the Shell Four-Ball Wear Tester and the Falex Tester. It has been found that systems showing high wear rates in one tester will also show high wear rates in the other. If wear is expressed as volume or weight loss (W), it may generally be correlated with load (L) and time (t) by an expression of the form $W = KLt$ for either tester. The constant K includes the characteristics of the machine, the nature of the specimens and the nature of the lubricant. It is concluded that the essential nature of the action taking place in either tester is identical and that therefore any lack of correlation must be attributed to operation in widely different pressure and temperature ranges. The correlation of wear rates with the frictional characteristics of the different systems was attempted in both testers with moderate success. The reproducibility of the results for various systems is too poor to permit differentiating between the different titanium base alloys used in any particular treatment. As for the various surface treatments investigated, it appears that it is possible to obtain equivalent wear resistance in many cases using electroless nickel plates, cyanided, nitrided, carburized, oxidized, or carburized iron-plated titanium. Of these, oxidized and electroless nickel plated titanium fail at high loads. The use of conventional lubricants for any but electroless nickel and carburized iron-plated titanium is unreliable. Halogenated materials appear to be the best lubricants for the other treatments. It has been shown that the higher the halogen content of the lubricant, the better its lubricating properties. (auth)

7266 WADC-TR-57-344
Westinghouse Electric Corp. Aviation Gas Turbine Div., Kansas City, Mo.
DEVELOPMENT OF NIOBIUM-BASE ALLOYS. Period [covered] January 1, 1956 to March 1, 1957. Richard T. Begley, ed. Nov. 1957. 112p. Contract AF33(616)-3316.

The flow and fracture characteristics of commercial purity powder metallurgy niobium were investigated in the range 250 to −196°C. Niobium was found to undergo a ductile-brittle transition in the range −125 to −196°C, and the transition temperature range of niobium was found to be less affected by the presence of interstitial impurities than many other body-centered cubic metals. The creep-rupture properties of powder metallurgy niobium were investigated at 982 and 1093°C (1800 and 2000°F), and the 100-hour rupture strength of commercial niobium in vacuum was determined to be significantly greater than unalloyed molybdenum. The creep-rupture results suggest that small quantities of gaseous contaminants may be responsible for the high strength of commercial niobium at elevated temperatures. The oxidation behavior of niobium was investigated in the temperature range 350 to 700°C. At the higher temperatures, oxidation followed a linear rate law. Between 500 and 625°C, the rate of oxidation was found to be nearly independent of temperature. Oxygen and nitrogen contamination of welding atmospheres was studied to determine its effect on the weld properties of niobium. Nitrogen was established to be very detrimental to the mechanical properties of niobium welds. High-purity niobium, having a hardness of less than 60 VPN, was produced by cage-zone refining techniques. (auth)

7267 WADC-TR-57-487
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
THERMAL PROPERTIES OF HIGH TEMPERATURE MATERIALS. [Period covered] June 1, 1956 to June 30, 1957. I. B. Fieldhouse, J. C. Hedge, J. I. Lang, and T. E. Waterman. July 12, 1957. 87p. Project title: MATERIALS FOR GE-ANP SUBSYSTEMS. Task title: GE-ANP MATERIALS. Contract AF33(616)-3701. (AD-150954).

The objective of this program was the measurement of the high temperature thermal properties of materials. The materials investigated were Hastelloy B, Hastelloy C, Stellite 21, Stainless Steel type 17-7 P.H., Stainless Steel type 446, Silicon Carbide, 60-15 Cr (ASTM B83-46), and beryllium. The thermal conductivity, specific heat, and linear coefficient of thermal expansion were measured from 1000°to 3000°F, or the melting point of the material, whichever was lower. All measurements were made in the Heat Transfer Laboratory of the Propulsion and Fluid Mechanics Research Department, Armour Research Foundation of Illinois Institute of Technology. Both the experimental measurements and the results of the conversion of these measurements to the desired physical properties are given. (auth)

7268 WADC-TR-57-514
Stanford Research Inst., Menlo Park, Calif.
DEVELOPMENT OF ELECTROPLATING PROCESSES TO ELIMINATE HYDROGEN EMBRITTLEMENT IN HIGH-STRENGTH STEEL. Period Covered: February 1956 to May 1957. J. E. Chilton. Nov. 4, 1957. 84p. Project title: FINISHES AND MATERIALS PRESERVATION. Task title: ELECTRODEPOSITION AND ELECTROCHEMICAL TREATMENTS. Contract AF33(616)-3429. (AD-142316).

The embrittlement of cadmium plated high-strength steels e.g., (SAE 4340) by hydrogen is of serious concern to the Air Force. Unexpected failures of highly stressed components have been experienced. It has been found that cadmium plating from a sulfamate, a perchlorate, or a fluoborate bath with addition agents can be accomplished without embrittling the steel, but that the quality and adherence of the cadmium plate emerging from these baths, as compared with the cadmium plate from a cyanide bath, indicates the need for further evaluation before use. In order to evaluate the effects of various degrees of hydrogen embrittlement on the steel, a sensitive mechanical test method was required. The important criteria were that the test coupon be of such geometry that it could be plated uniformly and that the test would evaluate only the effect of hydrogen embrittlement. Simple bend tests and

notched bar tensile tests have been commonly used for studying the embrittling effect. The bend test, torsion test, and static sustained load beam test were investigated. A static sustained load beam test, using a 9- × ¼- × ½-in. specimen with the grain transverse to the length was adopted. The SAE 4340 specimens were heat treated to 280,000 to 300,000 psi tensile strength and the fracture time, under a given stress, was taken as a measure of the degree of hydrogen embrittlement. It was found that replicate specimens show a large deviation in fracture times in spite of the care that was given to the selection, preparation, and testing techniques. These deviations are due to the normal defects and variables that are present in commercial, air melted, aircraft quality steel. (auth)

7269 WADC-TR-57-630
Titanium Metals Corp. of America, New York.
THE DETERMINATION OF THE EFFECT OF HEAT TREATMENT ON THE ELEVATED TEMPERATURE STRESS-STABILITY OF TITANIUM ALLOYS. Period Covered: May 1956 to May 1957. G. A. Lenning, N. L. Greenlee, W. M. Parris, and H. D. Kessler. Sept. 30, 1957. 87p. Project title: METALLIC MATERIALS. Task title: TITANIUM METAL AND ALLOYS. Contract AF33(616)-3638. (AD-151000).

The effect of duplex solution and age type heat treatments on the properties of one commercial heat each of the Ti–140A (Ti–2Fe–2Cr–2Mo), Ti-155A (Ti–5Al–1.5Fe–1.5Cr–1.5Mo), and Ti–6Al–4V alloys were investigated. The properties studied included tensile, notch tensile, notchbend impact, and elevated temperature stress-stability. (auth)

7270 WADC-TR-58-11
Vitro Labs., West Orange, N. J.
PREPARATION OF PROTECTIVE COATINGS BY ELECTROPHORETIC METHODS. Period Covered: March to October 1957. Allen C. Werner and Robert J. Abelson. Nov. 30, 1957. 26p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(616)-5002. (AD-150970).

An investigation was conducted of the preparation of oxidation-resistant coatings for molybdenum by electrophoretic methods. Multilayer coatings of 80% nickel–20% chromium and nickel-bonded Nb and titanium carbide provided good oxidation resistance and good erosion resistance. The ballistic impact resistance requirement was fulfilled by inclusion of a 50% dense, 80% nickel–20% chromium layer. The effects of sintering and coating thickness on resistance to thermal shock were noted. Attempts to incorporate an intergranular diffusion barrier alloy layer for oxidation resistance at 2000°F proved unsuccessful, although a gold-chromium diffusion barrier layer proved resistant at 1800°F. The coating technique has been refined to permit application of a single layer in one operation instead of two. (auth)

7271 WAL-TR-401/294
Watertown Arsenal Lab., Mass.
THE EFFECT OF REDUCTION AND TEMPERATURE UPON ROLLING LOAD, SPREAD, AND FORWARD SLIP IN THE HOT ROLLING OF TITANIUM AND TITANIUM ALLOYS. Frank R. Larson and John Nunes. Mar. 1958. 98p. DA Project 593-32-003.

An experimental study was conducted of the hot rolling characteristics of four titanium base materials and, for comparison, a mild steel. The titanium alloys, Ti-75A, RC-130A, Ti–6Al–4V, and RC-130B, were rolled at two speeds of 30 and 195 surface feet per minute, at rolling temperatures of 1000 to 2000°F, and reductions ranging from approximately 10 to 50%. Measurements were made of the rolling load, lateral spread, and forward slip. A limited study of specimen width effects with Ti-75A was also made. It was found that the rolling load, specific pressure, lateral spread, and forward slip increase with reduction. The increases in rolling load with reduction were most pronounced in the low temperature range (below the beta transus). One of the important results of this investigation was the very sharp rise, below the beta transus, of rolling load with decreasing temperature. (auth)

7272 WAPD-MP-377
[Westinghouse Electric Corp.]. Atomic Power Div., [Pittsburgh].
PHOTOMICROGRAPHS OF ZIRCALOY B, MASTER ALLOY AND MASTER-MASTER ALLOY. R. J. McClintick. Sept. 11, 1953. Decl. Apr. 15, 1957. 9p. $1.80(ph OTS); $1.80(mf OTS).

A specimen of natural uranium Zircaloy B fuel alloy which was submitted for investigation of the general microstructure as part of the development program on Zircaloy B was found to contain a minor phase not found in Zircaloy A. To investigate further this phase a series of photomicrographs were obtained of Zircaloy B, master alloy and master-master alloy. X-ray-diffraction studies made on this minor phase as it appeared in the master-master alloy identified it as ZrB_2. Based on the hardness and brittleness, the physical appearance in the microstructure, and the relative amount of the minor phase in master alloy and Zircaloy B, it is assumed that this phase is also ZrB_2. (auth)

7273 WAPD-PWR-FE-1128
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THE EFFECT OF LONGITUDINAL MARKINGS ON THE BURSTING STRENGTH OF ZIRCALOY-2 TUBING. L. F. Cochrun and K. M. Goldman. Nov. 28, 1955. 5p. $1.80 (ph OTS); $1.80(mf OTS).

The purpose of this investigation was to obtain a basis for specification of limiting depth of flaws in Zircaloy-2 tubing, as evaluated by bursting strength. The effect of shallow helical grooves was reported in WAPD-FE-893, and the effect of concentric scratches was reported in WAPD-FE-978. (auth)

7274 AEC-tr-3123
THE ROLE OF SURFACE FILMS IN THE REACTION OF ZIRCONIUM WITH HYDROGEN. E. A. Gulbransen and K. F. Andrew. Translated from Rev. mét. 51, 101-7 (1954). 18p.

The effect of oxide films on the nature of the zirconium-hydrogen reaction was studied. A table summarizes the effect of surface oxides on the rate of the hydrogen reaction. Hysteresis was studied by investigating the reversibility of the absorption and desorption of hydrogen. The effect of temperature, time, and pressure on the reaction rate was also studied. (J.S.R.)

7275 AEC-tr-3164
TWO NEW RESULTS ON THE COMPOSITION OF ELECTROLYTICALLY POLISHED BATHS. (Deux Nouveaux Résultats Relatifs à la Composition des Bains de Polissage Électrolytique). P. Brouillet and I. Epelboin. Translated from Rev. mét. 51, 693-701(1954). 14p.

7276 AEC-tr-3177
RATIONAL METHOD OF FABRICATION OF SHEET INGOTS. I. D. Kuzema. Translated by Michael Roman from Stal' 17, 541-3(1957). 8p.

The method for calculating fabricating coefficients for sheet metal without taking into account the dimensions of sheet as per order leads to an excessive cost of metal. Introducing variable fabricating coefficients, calculated as

to dependence on dimensions of the sheets, according to the described method allows for a significant decrease in the cost of metal per ton of serviceable drawn out sheet iron. (auth)

7277

DETERMINATION OF EQUILIBRIUM DIAGRAMS OF BINARY ALLOYS BY EXPERIMENTS WITH INTERMETALLIC DIFFUSION. APPLICATION TO U–Zr. Jean Philibert and Yves Adda. Compt. rend. 245, 2507-10(1957) Dec. 23. (in French)

The concentration-penetration curves relative to diffusion couples of two metals present discontinuities of concentration which correspond to the isothermic intersections of the solubility curves of the equilibrium diagram. The curve is applied to the determination of the uranium–zirconium diagram. (tr-auth)

7278

METALLOGRAPHIC EXAMINATION OF IRRADIATED URANIUM. J. Bloch (Service de Radiometallurgie, C.E.A., France). Acta Met. 6, 126-7(1958) Feb. (In French)

A metallographic examination was made of uranium which had been exposed to energies from 17 to 220 Mwd/t. Increasing energy causes increasing numbers of fine macles. At 220 Mwd/t a recrystallization was observed, and also the appearance of numerous intercrystalline fissures. (J.S.R.)

7279

INVESTIGATION OF THE DIFFUSION OF BORON AND CARBON IN CERTAIN METALS OF TRANSITION GROUPS. G. V. Sansonov and V. P. Latysheva (Moscow Inst. of Nonferrous Metals and Gold, USSR). Fiz. Metal. i Metalloved. 2, No. 2, 309-19(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3890).

A report is given on a phase analysis and determination of the microhardness of the products of reaction diffusion of B and C in Ti, Zr, Nb, Ta, Mo, and W. Equations were determined for the temperature dependence of the coefficient of diffusion of C and B in the above transition metals. The values of the activation energy Q are connected with the value of the ionization potential of the diffusing metalloid and the degree of incompletion of the d-electron sublevels of these metals. The values of Q have a correlation with the values of other physical constants of transition metals and carbide phases. (auth)

7280

THE INVESTIGATION OF PHASE TRANSFORMATIONS AT SUPERHIGH PRESSURES. V. P. Butuzov. Kristallografiya 2, No. 4, 536-47(1957).

A pressure vessel has been designed and constructed, following principles similar to those used by Bridgman, which enables pressures of 30,000 to 34,000 kg/cm^2 to be reached. An internal heater is incorporated which will heat gases to 1500°C and liquids to 600°C. Methods of measuring the temperature, pressure, and heat of transformation in the vessel have been developed. The internal volume of the working space is 10 to 20 cm^3. The pressure is measured from the resistance of a manganin coil and the temperature by a differential thermocouple to ± 0.5°. The latter works between the hot specimen and the massive base plug of the chamber, the temperature of which is measured by an external thermocouple to 0.1 C. Six leads enter the working chamber. The variation of m.p. with pressure was measured for Cu, Al, Sb, Zn, Pb, Cd, Tl, and Sn up to 32,000 kg/cm^2 for all but Cu for which the limit was 17,000 kg/cm^2 at which temperature the m.p. was 1155°C. The polymorphic transformations of P and Bi were investigated, and the phase diagram for the latter was completed by the addition of the boundaries between the β-phase and the liquid and the γ-phase and the liquid. For the remainder of the diagram the author's data agreed closely with those of Bridgman. Black crystalline phosphorus was investigated up to 20,000 kg/cm^2 and 1200°C but no new phase was found. On compressing red phosphorus a new modification was observed above 40,000 kg/cm^2 and 600°C which transformed reversibly with a very small thermal effect. (TCO)

7281

REVIEW OF BINARY SYSTEMS OF TITANIUM AND SUGGESTIONS ON THEIR CLASSIFICATION. G. V. Samsonov, V. S. Neshpor, and L. V. Lange. Metalloved. i Obrabotka Metal. No. 1, 51-9(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11176)

7282

SOVIET ACHIEVEMENTS IN THE FIELD OF METALLURGY AND METALS TECHNOLOGY. A. A. Astaf'yev. Metalloved. i Obrabotka Metal. No. 11, 2-17(1957).

A general review of Soviet achievements in the field of metallurgy and metals technology is presented. The information given does not relate exclusively to post-war developments. Particular attention is given to problems connected with high-temperature steels. (J.S.R.)

7283

TRENDS OF DEVELOPMENT OF HIGH TEMPERATURE METALLOGRAPHY. M. G. Lozinskiy. Metalloved. i Obrabotka Metal. No. 11, 18-42(1957).

The author, a leading authority in this field, reviews exhaustively Soviet developments in high-temperature metallurgy. (J.S.R.)

7284

THE THERMODYNAMIC ACTIVITY OF LEAD IN LIQUID SOLUTIONS OF A LEAD–SILVER SYSTEM. V. N. Yeremenko. Ukrain. Khim. Zhur. 23, No. 1, 6-12(1957).

The activity, coefficients of activity, and relative partial molar heat contents and entropies of lead were measured in liquid double solutions of lead-silver. The electromotive forces and temperature coefficients E.D.S. were determined at a silver content up to 56 at. %, between the temperatures 450 to 760° for concentrated chains of the formula: $Pb_{liqu.}/PbCl_2$ (in KCl sol.) + LiCl/Pb (in Ag sol.). Lead containing 0.004% bismuth and 0.002% Cu was used for the experiment. The impurities of silver did not exceed 0.01 weight %. After extraction and homogenization of the solutions, the measurements were carried out at small temperature intervals (5 to 15°C). Temperatures of the crystallization principles were determined and results found to be in good agreement with those obtained by different methods. Considerable deviations from Raoult's Law occur in the system Pb–Ag. These deviations diminish with increasing temperatures in solutions containing more than 25 at. % Ag. At smaller Ag content the deviations are practically independent of the temperatures. It was shown that the difference of thermal capacity of lead in pure liquid states and in solutions with silver depends on the composition of the solution and is independent of the temperature. Liquid solutions of Pb–Ag show a tendency to separation. (TCO)

7285

ON THE PROBLEM OF DETERMINATION OF THERMODYNAMIC CONSTANTS OF METALS AND ALLOYS. L. I. Ivanov, M. P. Matveyeva, and I. S. Kulikov (Inst. of Metallurgy of the Academy of Sciences, USSR). p.11-16 in "Issledovaniya po Zharoprochnym Splavam. Moscow, Publishing House of Academy of Sciences, of SSSR, 1956." (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11120)

A description is given of three methods for determining

thermodynamic constants of metals and alloys, utilizing radioactive isotopes, which are used at the Institute of Metallurgy of the Academy of Sciences USSR. 1. Determination of the rate of evaporation from the amount of substance evaporated from open surface and condensed on cells cooled with liquid nitrogen. 2. Determination of rate of outflow of saturated vapor, into high vacuum, from closed space through calibrated opening. In both methods amount of condensate was determined radiochemically. Due to necessity of of using high activities the instrument for method 2 has remote control. Both these methods do not insure exact determination of partial values due to changes in concentration at the surface of sample under study. 3. Determination of rate of isotope exchange through the vapor phase, between active and inactive samples of same composition. The last mentioned method makes it possible to determine heat of sublimation, diffusion coefficient and activation energy on diffusion in metals and alloys. Diagrams of instruments for the described methods are shown.

7286

MICRORADIOGRAPHIC STUDIES OF THE ROLLING PROCESS. Friedrich Erdmann-Jesnitzer and Fritz Günther (Institut für Metallkunde und Materialprüfung der Bergakademie, Freiberg, Sa.). Z. Metallk. 49, 9-16(1958) Jan. (In German)

The orientation in rolling direction and the destruction of Al_3Fe and Al_3Ni inclusions in aluminum alloys were investigated microradiographically. Orientation, elongation, and destruction of the enclosed needle-shaped intermetallic compounds were observed as a function of initial position and the degree of rolling in cold and hot rolling. The results are discussed. (tr-auth)

7287

TRANSITION CREEP IN CUBIC FACE-CENTERED METAL CRYSTALS. Hubert Blank (Technischen Hochschule, und Max-Planck-Institut für Metallforschung, Stuttgart). Z. Metallk. 49, 27-39(1958) Jan. (In German)

The transient creep of single crystals of aluminum, copper, and nickel was investigated at and above room temperature. At room temperature the creep behavior of the three metals was similar; at high temperatures there was a strong difference. The creep behavior is quantitatively connected to the stress-strain curve. (tr-auth)

7288

DIFFUSION OF HYDROGEN THROUGH IRON AND BINARY IRON–CHROME AND IRON–NICKEL ALLOYS AT HIGH PRESSURES AND TEMPERATURES. A. A. Shicherbakova. Zhur. Priklad. Khim. 29, No. 6, 879-84 (1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3891).

It was established that the speed of diffusion of hydrogen through binary alloys Fe–Cr (0.97 to 0.41% Cr) and Fe–Ni alloys (1.29 to 98.84% Ni) at a pressure of 100 atm. and a temperature from 200 to 600° is described by the equation $v = K \exp(-E/RT)$. The speed of diffusion of hydrogen through the binary Fe–Cr alloys at a pressure of 100 atm. and a temperature from 200 to 600° diminishes considerably when the chromium content in the iron is increased to 19%. The speed of diffusion of hydrogen through the Fe–Ni alloys under the same experimental conditions increases noticeably with addition of Ni from 1.29 to 10%, but further increase of Ni in the alloy from 10 to 20% causes a considerable reduction in the speed of diffusion of hydrogen. (auth)

7289

SPOT AND SEAM WELDING OF SPECIAL STEELS AND ALLOYS. D. S. Balkovets, B. D. Orlov, and P. L. Chuloshnikov. Moscow, Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti, 1957. 430p.

The book is intended for scientific research institutes of technology, as well as for a wide circle of practicing engineers, designers, technologists and personnel engaged in the field of quality control, and for persons interested in spot and seam welding techniques. The book presents extensive information on the technology of spot and seam resistance welding. Welding machinery, equipment, and measuring instruments are described and illustrated. Suggestions for adequate design of spot or seam welded frames and tight, thin sheet-metal structures from structural steels, heat resistant and non-ferrous alloys are given, and basic methods employed in quality control of welds are presented. Failures in weld joints, causes of defective welds and methods of their detection are discussed and illustrated. Special measuring and testing instruments employed for the set-up and adjustment of welding machines are described, and methods of eliminating operating trouble are suggested. 83 references. (TCO)

PHYSICS

7290 ALI-C-59272

Little (Arthur D.) Inc., Cambridge, Mass.

THE PARTIAL FREE ENERGY OF OXYGEN IN TITANIUM METAL. Final Report. Feb. 1958. 31p.

The object of this study was to obtain thermodynamic data on the partial free energy of oxygen in titanium–oxygen alloys at concentrations below 1% oxygen by weight and over as wide a temperature range as possible. Data were obtained by the equilibration of titanium metal samples with calcium metal and calcium oxide in a closed system. At equilibrium in this system, the chemical potential of oxygen in the alloy is equivalent to the chemical potential of oxygen determined by the interaction of calcium and oxygen to form calcium oxide. Experimental studies were completed at temperatures from 764 to 1300°C. Values for the desired partial free energy of oxygen in each experimental test were calculated directly from the thermochemical data available in the literature for calcium oxide. From calculated partial-free-energy values and the experimental oxygen contents of the alloys, and with reasonable assumptions, an expression was derived for the partial free energy of oxygen in titanium-oxygen alloys as a function of temperature and mole fraction of oxygen. Thus, values of partial free energy at higher and lower temperatures and oxygen contents than were covered by experiment could be obtained by extrapolation. These data are plotted for temperatures from 727 to 1727°C (1000 to 2000°K) and oxygen contents from 0.01 to 1% by weight. No data are available for the liquid titanium region, and extrapolation into this region was not attempted. These studies indicate that conditions for the reduction of titanium–oxygen alloys by calcium metal are optimum at approximately 1150°K. At this temperature, the oxygen content can be reduced to 0.025% by weight. (auth)

7291 AERE-R/M-124

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

TESTS ON THE PUMP UNIT FOR THE Mk. I URANIUM–BISMUTH LOOP (B.E.P.O.). E. E. Hutchins. May 1957. 12p.

This memorandum describes tests carried out to determine the characteristics of the centrifugal, induction-driven pump unit, built into the Mk I Uranium–Bismuth loop which is to operate in B.E.P.O. Reference is also made to the apparatus employed for making the tests. (auth)

7292 NAA-SR-1713
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
SOLID STATE PHYSICS PROGRESS REPORT [FOR] JANUARY–JULY 1956. (AEC Research Division Projects). C. E. Dixon and J. E. Hove, ed. Nov. 15, 1956. 21p. Contract AT-11-1-GEN-8. $0.75(OTS).

Topics reported on include magnetoresistance of a uranium single crystal, energy band calculations for thorium, uranium and plutonium, thermal self-diffusion in copper, annealing of cold-worked copper by electron irradiation, electrical resistivity study of lattice defects introduced in copper by 1.25 Mev electrons at 80°K, nickel electrical resistivity changes caused by electron irradiation, and a discussion on the choice of an atomic interaction potential function for use in radiation damage calculations. (For preceding period see NAA-SR-1637.) (auth)

7293 NP-6595
New York Univ., New York.
FLUORESCENCE AND CONDUCTIVITY PHENOMENA. Quarterly Progress Report No. 3 for August, September, October [1957]. Hartmut Kallmann. Jan. 1958. 81p. Contract DA-36-039-sc-73145.

Progress is reported in studies on energy transfer in liquid solutions under light and high energy excitation; energy transfer in plastics; the effect of externally applied d-c and a-c photoconductivity of ZnS and ZnCdS powder phosphors; and the effect of externally applied fields on the trap occupation distribution of ZnS and ZnCdS phosphors. (For preceding period see NP-6544.) (W.L.H.)

7294 NP-6619
Bartol Research Foundation, Swarthmore, Penna.
SEVENTH ANNUAL REPORT OF THE WORK OF THE BARTOL RESEARCH FOUNDATION OF THE FRANKLIN INSTITUTE. C. E. Mandeville. Sept. 30, 1957. 111p. Contract N6ori-144.

A description of work on lifetimes of the 4.43 Mev excited state of C^{12} and the 4.46 Mev excited state of B^{11} is given. The study of resonance fluorescence using radioactive isotopes as the sources of the exciting radiation was limited to the investigation of As^{75} using the radiation from Se^{75}. Information on the nature of the photosensitivity of Geiger counters is presented. The activities of the cosmic ray program are outlined, particularly balloon flights, the shipboard neutron monitor, and the Thule neutron monitor. (For preceding period see NP-6294.) (M.H.R.)

7295 NP-6620
Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
QUARTERLY PROGRESS REPORT NO. 48 [FOR] PERIOD ENDING NOVEMBER 30, 1957. J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. Jan. 15, 1958. 179p. Project 3-99-00-100. Contract DA-36-039-sc-64637.

Research is reported on the fields of physical electronics; microwave discharge, spectroscopy, electronics, and theory; solid state physics; nuclear magnetic resonance and hyperfine structure; statistical communication theory; information processing and transmission; communications biophysics; and neurophysiology. (For preceding period see NP-6495.) (D.E.B.)

7296 RIB-27
David Sarnoff Research Center, Princeton, N. J.
DEVELOPMENT OF HIGH SPEED ELECTRON ACCELERATOR STRUCTURES. Quarterly Report No. 5 [for] August 1, 1957–October 31, 1957. M. H. Greenblatt, R. M. Matheson, A. H. Sommer, and G. O. Fowler. Feb. 20, 1958. 22p. Contract AT(30-1)-1958. $4.80(ph OTS); $2.70(mf OTS).

Improvements made in the equipment used for measuring transit time spread in photomultipliers are described. Results obtained with central electrode structures are presented. A 24-stage multiplier was built for experiments on the application of scintillation counters to reactor control problems and to obtain experimental confirmation of the estimated effect of pulse-height fluctuation on the precision of time measurements. Measurements performed on type C7251 photomultipliers are described. (For preceding period see RIB-25.) (W.L.H.)

7297 SCTM-297-57(51)
Sandia Corp., Albuquerque, N. Mex.
AIR-GUN STUDIES OF FERROELECTRIC MATERIALS. E. A. Ripperger and A. F. Beck. Feb. 6, 1958. 50p. Contract AT(29-1)-789. $1.50(OTS).

Specimens of two ferroelectric materials, barium titanate and lead-zirconate titanate, have been subjected to high dynamic stresses by impacting them with a projectile accelerated by an air gun. The purpose of these tests was to supplement information previously obtained using high explosives to stress the ferroelectric materials. Measurements of voltage and current outputs were made of both materials with impact velocities ranging from 260 to 667 ft/sec. Voltage output measurements were made on $BaTiO_3$ specimens in both normal mode (impact direction normal to axis of polarization) and axial mode (impact direction parallel to axis of polarization). Voltage and current output measurements were made on lead-zirconate titanate specimens in the axial mode. (auth)

7298 WAPD-CTA(RM)-341
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
CONFERENCE ON BEARING DEVELOPMENT FOR WATER LUBRICATED APPLICATION: SUMMARY OUTLINE OF TALKS. Oct. 18, 1955. 38p. $0.30(OTS).

7299 AEC-tr-3149
THE "ADIABATIC INVARIANCE" OF THE MAGNETIC ORBITAL MOMENTS OF CHARGED PARTICLES. F. Hertweck and A. Schlüter. Translated from Z. Naturforsch. 12a, 844-9(1957). 16p.

The magnetic moment μ of the motion of a charged particle in a magnetic field is an approximate constant of motion in moderately varying magnetic fields. For the special case of a homogeneous time-dependent magnetic field, it is shown that the relative change in μ between two different states of constant field decreases at least exponentially in h/α if α/h tends to zero, where α represents the relative rate of change of the magnetic field and h denotes the gyrofrequency. (tr-auth)

7300 AEC-tr-3151
FORCE-FREE MAGNETIC FIELDS. [PART] II. A. Schlüter. Translated from Z. Naturforsch. 12a, 855-9 (1957). 13p.

The general solution of the differential equation of force-free magnetic fields is given in the case of cylindrical symmetry. The energy density has to fulfill two inequalities; apart from this, it can be freely chosen as a function of the distance from the axis of symmetry. The components of the field as well as the electric current density follow from it purely by differentiation. By explicitly constructing a three-parameter family of such force-free fields, it is shown that the amount of momentum and of angular momentum transported by the field in the direction of the axis is not determined by the total magnetic and electric flux of the field. (tr-auth)

7301 AEC-tr-3165
THE DYNAMICS OF DESORPTION FROM SOLUTIONS. M. B. Tovbin and A. D. Greenburg. Translated from Zhur. Fiz. Khim. 26, 156-64(1952). 17p.

A study was made of the dynamics of desorption of iodine from a layer of activated coal by elution with potassium

iodide solution. It was shown that a certain portion of iodine (about 20%) cannot be removed by elution with a solvent (retaining capacity). The hypothesis was advanced that the retaining capacity of the porous absorbent may be due to the appearance of pseudo "desorption equilibrium" during which practically all the substance being desorbed may be readsorbed on the neighboring free surface of the absorbent. (Thus the total rate of the process becomes infinitely small). This hypothesis was proven experimentally by the fact that the same quantity of iodine, which cannot be desorbed by elution, is irreversibly absorbed by coal from a solution and also by the dependence of the retaining capacity of coal on the rate of elution. A study was made of the effect of various factors (rate of elution and temperature) on the nature of desorption curves for iodine. It was shown that under the experimental conditions used, the desorption of iodine is affected by both external diffusion and internal diffusion. The rates due to external and internal diffusion are measurable and depending on conditions (rate of elutions, degree of iodine saturation) one or the other limits the observed rate. It was shown that when the kinetics of desorption is determined by internal diffusion (for high saturations and for high elution rates) the rate of the process is not clearly determined by the degree of saturation. Under these conditions non-uniformity of the surface of the coal is clearly manifested. (auth)

7302 AEC-tr-3185

THE THEORY OF THE INFLUENCE OF CONCENTRATION ON THE FLUORESCENCE OF SOLUTIONS. S. I. Vavilov. Translated by Isadore B. Berlman from Zhur. Eksptl'. i Teoret. Fiz. 13, 13-32(1943). 34p.

7303 SCL-T-168

WHAT POSSIBILITIES ARE OFFERED BY PSEUDO RESISTANCE MEASUREMENTS OF BARRIER LAYERS? (Welche Moglichkeiten Bieten Scheinwiderstandsmessungen an Sperrschichten?) H. L. Rath. Translated by M. I. Weinreich from Nachrtech. Fachber. 5, 15-26(1956). 30p.

The results which can be given by the impedance measuring method are reported. The effects which basically determine the capacitive behavior of barrier layers in semiconductors are discussed. Several examples which clarify the application of fundamental data to certain special cases are given. It is shown how a combination of the pulse technique with the pseudo resistance measuring method makes it possible to investigate effects of inertia and time. (tr-auth)

7304

CATALYZED FUSION. S. Gallone. Energia nucleare (Milan) 5, 81-4(1958) Feb. (In Italian)

The author describes some aspects of fusion reactions, catalyzed by μ mesons, illustrating the process of mesic molecule formation and fusion of their nuclei. (auth)

7305

RESEARCH ON CONTROLLED THERMONUCLEAR FUSION AT SACLAY. Jean Charon. Ind. Atom. 2, No. 3-4, 25-32 (1958). (In French)

The general problems concerning controlled thermonuclear processes are discussed. Heating of the plasma, its confinement and stability, and control and recovery of the energy of fusion are all considered. A possible design of a future fusion reactor is described. (J.S.R.)

7306

ARRANGEMENT FOR DETAILED INVESTIGATION OF DECAY CURVES OF PHOSPHORESCENCE UPWARDS OF 0.1 SEC IN DURATION. V. A. Pilipovich and B. Ya. Sveshnikov. Optika i Spektroscopiya 4, 116-18(1958) Jan. (In Russian)

A simple scheme is offered for an accurate determination of the luminescence attenuation curves in the range from 0.1 sec to several minutes with intensity variations of 10^7. The apparatus was used for investigations of the phosphorescence kinetics of organic luminors. The installation may be also applied to the investigation of phosphor crystals, chemical luminescence kinetics, and, with some alterations, for the studies of chemical reaction kinetics. (R.V.J.)

7307

CALORIMETRIC ASSEMBLY FOR THE MEASUREMENT OF HEATS OF FUSION OF INORGANIC COMPOUNDS. J. Goodkin, C. Solomons, and G. J. Janz (Rensselaer Polytechnic Inst., Troy, N. Y.). Rev. Sci. Instr. 29, 105-8 (1958) Feb.

The apparatus consists of a colorimeter of basically simple design, above which is a movable, vertical furnace for heating the specimen contained in a hermetically sealed platinum capsule. A complete series of measurements may thus be carried out on one sample. The capsule is dropped directly into a metal dry-chamber in the calorimeter in contact with a stirred liquid for measurement of heat content changes. A recommended procedure, based on experiments in pairs is described; one of each pair being a calibration drop, the other the specimen drop. The computation of heat content changes from the temperature changes observed is described. The limits of error of this and other calorimetric assemblies are critically discussed. Data to illustrate the results for the LiCl–KCl eutectic mixture (mp 354.1°C) and the reproducibility of the measurements are given. The calorimetric assembly is capable of measurements of heats of fusion of inorganic compounds to an accuracy of ±2%. (auth)

7308

ELECTRICAL LEAD-IN FOR PRESSURE VESSEL. F. J. Edeskuty and R. H. Chrisman (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 29, 178(1958) Feb.

A solution is given for the problem of bringing insulated electrical leads into pressure vessels at pressures up to 20,000 psi. (A.C.)

7309

ON THE THEORY OF CONCENTRATION QUENCHING OF FLUORESCENT SOLUTIONS. B. Ia. Sveshnikov. Soviet Phys. (Doklady) 1, 633-6(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3879.

7310

LUMINESCENCE FLASHES IN ZINC SULFIDE CRYSTALS AND THE TWO-STAGE EXCITATION MECHANISM. N. A. Tolstoi. Soviet Phys. (Doklady) 1, 698-700(1956) Nov.-Dec.

Investigations in the area of luminescence flashing have shown this phenomenon to be much more universal than was anticipated. It can be used as the basis for a new method of investigating local phosphor levels. The processes revealed by the investigations are used in the construction of a theory of phosphorescence in sulfide phosphors. (J.S.R.)

7311

IONIC CONDUCTIVITY OF KI(Tl) PHOSPHORS. L. M. Shamovskii, A. A. Dunina, and M. I. Gosteva (All-Union Minerals Inst.). Soviet Phys. (Doklady) 1, 725-7(1956) Nov.-Dec.

For electrical conductivity measurements of phosphors pure KI crystals and KI(Tl) phosphors were used. The results of the measurements as a function of temperature are graphed. It was shown that small quantities of the TlI activator added to the KI crystals caused the conductivity to drop sharply. The presence of an activator, however, does not essentially change the equilibrium concentration of the structural defects and their mobility. With considerable activator concentration the ionic conductivity rises sharply.

At low temperatures unactivated crystals acquire the properties of typical phosphors. These characteristics indirectly confirm the concept of a luminescence mechanism based on the microheterogeneous phosphor structure and double activator distribution. (J.S.R.)

7312
MAXIMUM AMPLIFICATION FACTOR AND NOISE OF PHOTOMULTIPLIERS. E. K. Zavoiskii (Academy of Sciences, USSR) and M. M. Butslov and G. E. Smolkin. Soviet Phys. (Doklady) 1, 743-6(1956) Nov.-Dec.

The principle of the electron-optical amplification of light enables one to attain an amplification factor of any magnitude. The factor would have a limiting value which permits the photographing of a minimum possible signal—that of a single electron. The photographing of a single electron was achieved experimentally. The method used is described. (J.S.R.)

7313
BREMSSTRAHLUNG OF ULTRA-RELATIVISTIC PARTICLES IN A CENTRAL FIELD. A. G. Sitenko (Khar'kov State Univ.). Soviet Phys. JETP 5, 1223-6(1957) Dec. 15.

Bremsstrahlung of an ultra-relativistic particle of spin one-half in an arbitrary field with central symmetry is considered. A relation between the bremsstrahlung cross section and elastic scattering cross section is obtained for ultra-relativistic particles. (auth)

7314
COHERENT SCATTERING AND RADIATION OF ELECTROMAGNETIC WAVES BY A PLASMA IN AN INHOMOGENEOUS MAGNETIC FIELD. G. A. Askarian. Soviet Phys. JETP 5, 1285-6(1957) Dec. 15.

7315
STUDY AND SELECTION OF ALLOYS FOR HIGH TEMPERATURE THERMOCOUPLES. A. A. Rudnickiy and I. I. Tyurin. Zhur. Neorg. Khim. 1, No. 5, 1074-90(1956). (Translated from Referat. Zhur. Khim. No. 6, 1957, abstract No. 19789)

The selection of alloys for a high-temperature thermocouple was done. This thermocouple should work in the air, be stable for a long time at temperatures from 1350 to 1550°, and be applicable to short time measurements at about 1800°. Thermoelectrodes of pure Rh, of Pt–Rh alloys, and of triple alloys of Pt–Rh–W and Pt–Rh–Re were studied. The homogeneity of the thermoelectrodes, the stability of their thermoelectrical properties under various conditions, and the magnitude of the thermoelectromotive force were determined. The most stable under the above mentioned conditions was the Rh thermocouple (80% of Pt and 20% of Rh). This thermocouple is stable enough at 1800°, if insulation of corundum capillaries was used. The stability of thermocouples proposed by other authors was checked. A review of works concerning high temperature thermocouples is given. (tr-auth)

7316
THERMODYNAMICS AND STATISTICAL PHYSICS. A. G. Samoylovich. Moscow, Gosudarstvennoye Izdatel'stvo Tekhniko-Teoreticheskoy Literatury, 1955. 368p.

Approved as a textbook for state universities in Russia, this book includes basic principles of thermodynamics, basic principles of statistical physics, applications of statistical physics in research on classical systems, and quantum mechanics. (J.S.R.)

7317
THE INDUSTRIAL CHALLENGE OF NUCLEAR ENERGY, RESEARCH, USES, SOCIAL PROBLEMS. PAPERS GIVEN DURING THE SECOND INFORMATION CONFERENCE ON NUCLEAR ENERGY FOR MANAGEMENT, AMSTERDAM, 24-28 JUNE, 1957. Paris, The Organization for European Economic Co-Operation, 1958. 305p. $3.50.

The papers given at the Second Information Meeting on Nuclear Energy for Management sponsored by the Organization for European Economic Cooperation are presented. The topics include nuclear research, nuclear fuels, production of energy, and social problems. (J.S.R.)

Aerosols

7318
THERMAL PRECIPITATOR FOR CONTINUOUS AEROSOL SAMPLING. Clyde Orr and Roy A. Martin (Georgia Inst. of Tech., Atlanta). Rev. Sci. Instr. 29, 129-30(1958) Feb.

Thermal precipitation is attractive for airborne particle collection because of the high collection efficiencies which may be attained and the convenient examination of the deposit. Most thermal precipitators, however, have very low sampling capacities or flow rates. To take fullest advantage of the desirable features of thermal precipitation, a new precipitator was designed and constructed. It operated continuously, and deposited particles upon a moving tape or substrate. Complete collection of particles resolvable with an electron microscope was attained in a 3-in. diameter precipitating zone at a flow rate of 1 l/min. (auth)

Cosmic Radiation

7319 NP-6630
Institute of Nuclear Research, Warsaw. Cosmic Ray Dept., Institute of Nuclear Research, Krakow. Cosmic Ray Dept., and Institute for Physics of Csechoslovac Academy of Science, Prague.
ABOUT HIGH ENERGY INTERACTIONS IN NUCLEAR EMULSIONS. P. Ciok, T. Coghen, J. Gierula, R. Holyński, A. Jurak, M. Miesowicz, T. Saniewska, O. Stanis, and J. Pernegr. [Feb. 17, 1958]. 8p.

Thirty-six plates of the I-stack, which was exposed in the Po Valley expedition, were scanned for photon-electron cascades to find interactions of the highest energy. The plates were also area scanned for jets of lower energy. Measurements were made of the angular distribution of relativistic tracks. The energy of the colliding nucleons was determined for every jet. The results are analyzed. (M.H.R.)

7320
GEOMAGNETIC EFFECT OF EXTENSIVE SHOWERS OF COSMIC RAYS. Juraj Dubinsky, Pavel Chaloupka, Vaclav Petrzilka, and Lenka Tomaskova. Chekhoslov. Fiz. Zhur. 6, No. 1, 29-34(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3281).

7321
STUDY OF EXTENSIVE AIR SHOWERS. Lajos Janossy. Magyar Tudomanyos Akad. Kozponti Fiz. Kutatointezet Kozlemenyei 1, No. 1-2, 54-60(1953). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3282).

7322
MEASUREMENT OF DENSITY DISTRIBUTION IN EXTENSIVE AIR SHOWERS. Jozsef Koch, Tamas Sandor, Antal Somogyi, and Janos Szivek. Magyar Tudomanyos Akad. Kozponti Fiz. Kutatointezet Kozlemenyei 1, No. 1-2, 61-6(1953). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3283).

7323
NEW DATA ON THE BAROMETRIC EFFECT OF EXTENSIVE AIR SHOWERS. Tamas Sandor and Antal Somogyi. Magyar Tudomanyos Akad. Kozponti Fiz. Kutatointezet Kozlemenyei 2, No. 2, 165-70(1954). (Translated from Referat Zhur. Fiz. No. 2, 1957, abstract no. 3284).

7324
ZENITH ANGLE RESPONSE OF A VERTICAL MESON TELESCOPE. R. P. Kane and U. R. Rao (Physical Research Lab., Ahmedabad, India). Proc. Indian Acad. Sci. A47, 30-40(1958) Jan.

Expressions have been obtained for the Geometrical Sensitivity as a function of the zenith angle of a cosmic ray telescope comprising of counter trays of rectangular dimensions. The Radiation Sensitivity and Cumulative Sensitivity have also been calculated, assuming a zenith angle attenuation of the form $I_\theta = I_0 \cos^2\theta$ for cosmic ray intensity. (auth)

7325
A POSSIBLE EXAMPLE OF ANOMALOUS DECAY OF A HYPERFRAGMENT. A. A. Varfolomeev, R. I. Gerasimova, and L. A. Karpova. Soviet Phys. (Doklady) 1, 579-81(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 2946.

7326
K-MESON DECAY OF SLOW SECONDARY PARTICLE. A. A. Varfolomeev, R. I. Gerasimova, and L. A. Karpova. Soviet Phys. (Doklady) 1, 594-7(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3446.

7327
AN INVESTIGATION OF THE N COMPONENT OF EXTENSIVE AIR SHOWERS. S. N. Nikol'skii, Iu. N. Vavilov, and V. V. Batov (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 625-7(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3892.

7328
ON PION PRODUCTION BY HIGH-ENERGY COSMIC RAYS. Zh. S. Takibaev, P. A. Usik, and M. G. Antonova (Physico-Tech. Inst., Kazakh SSR). Soviet Phys. (Doklady) 1, 666-70 (1956) Nov.-Dec.

Cosmic showers with both a small angular spread (jets) and a wide angular spread of shower particles were investigated. An analysis of the data confirmed that jets are satisfactorily explained formally by the hydrodynamic theory. For wide showers the data tend to support the presence of a compound multiple process of pion production in a number of successive collisions between the incident particles and nucleons of the target nucleus. (J.S.R.)

7329
THE PENETRATING COMPONENT OF EXTENSIVE COSMIC RAY SHOWERS IN THE ATMOSPHERE. Iu. N. Vavilov, Iu. F. Evstigneev, and S. I. Nikol'skii (P. N. Lebedev Physical Inst., Academy of Sciences, USSR). Soviet Phys. JETP 5, 1078-84(1957) Dec. 15.

The spatial distribution of μ mesons arising from extensive air showers initiated by primary particles of various energies is investigated. It was found that within experimental errors the spatial distribution function for μ mesons did not depend on the energy of the primary particle. The number of μ mesons produced varied with the energy of the primary particle in such a way as to confirm the supposition, advanced previously, that the manner in which energy is distributed among the secondary particles in an elementary nuclear interaction changes at an energy of about 10^{15} ev. (auth)

7330
ANOMALOUS DECAY OF A HYPERNUCLEUS. A. P. Grigor'ev, E. P. Toporkova, and A. I. Fesenko (Moscow Engineering-Physical Inst.). Soviet Phys. JETP 5, 1299-1300(1957) Dec. 15.

An unusual decay of a hypernucleus observed in an emulsion chamber exposed to cosmic radiation in the stratosphere is reported. (A.C.)

Crystallography and Crystal Structure

7331
THE CRYSTALLOGRAPHIC ASPECT OF THE MECHANICAL TWINNING IN Ti AND α-U. Hiroshi Kiho (Univ. of Kyoto). J. Phys. Soc. Japan 13, 269-72(1958) Mar.

A crystallographic study on the mechanical twinning in Ti and α-U is made by a method similar to that in a previous paper, allowing more kinds of atom movements, and the twin elements, K_1, K_2, η_1, and η_2, are determined. It is found that $\{11\bar{2}2\}$ and $\{11\bar{2}4\}$ twins in Ti are reciprocal to each other and that the elements of $\{11\bar{2}1\}$ twin are in agreement with Hall's result. It is also found that a general result that a plane having the smallest shear S is liable to twin in order nearly holds in Ti and α-U. (auth)

7332
STRUCTURE ANALYSIS BY ELECTRON DIFFRACTION. Z. G. Pinsker and B. K. Vaynshteyn. Kristallografiya 2, No. 4, 552-72(1957).

The progress of studies in the field of electron diffraction during the last thirty years is reviewed. The development of structure analysis by electron diffraction has been the most important trend of investigation, promoting the advance of the theory of electron scattering and of the experimental technique. In establishing the limit of applicability of the kinematic theory, it is necessary to consider in addition to the crystal dimensions and ordinal numbers of components forming a given phase, also the degree of complexity of the structure and its symmetry. Various experimental data are considered which refer to revealing dynamic effects in examining experimental scattering curves, in measuring the banded structure on patterns obtained in a divergent beam and in measuring the effects of dynamic birefringence. The possibility of using the Kikuchi lines and Kikuchi bands for structure analysis is considered. The general course of structure determination by the electron-diffraction method is given. A discussion is presented of the Fourier synthesis as well as of the advantages and peculiar features of the electron-diffraction structure analysis as compared to the x-ray and the neutron-diffraction method. A description is given of the camera used in electron-diffraction analysis at the Institute of Crystallography. This is followed by a brief presentation of the results of the electron-diffraction studies carried out on hydrates of chlorides of some metals, clay minerals (seladonite); of the investigations of the position of hydrogen atoms in some inorganic and organic structures; of the studies of semi-conducting alloys of Bi, Cd, Tl, Sb, Se, Te and some other elements, including investigations of the amorphous structure of some phases of this kind. In connection with the discussion of the studies enumerated, many important peculiar features and possibilities of the electron-diffraction method are indicated, namely: precision of locating light atoms, study of the ionization state of some atoms, and a more precise determination of the composition of phases by the structure method. (TCO)

7333
ON THE INTERMOLECULAR TRANSFER OF EXCITATION ENERGY IN CRYSTALS. E. K. Zavoiskii (Academy of Sciences, USSR) and G. E. Smolkin. Soviet Phys. (Doklady) 1, 652-4(1956) Nov.-Dec.

A new theory for the mechanism for the intermolecular transfer of excitation energy in crystals was recently offered. This theory states that, when an ionizing particle

passes through a crystal, high electronic states are excited and transitions from these states are accompanied by emission of primary hard quanta of ~ 8 ev. This shortwave radiation is absorbed and emitted again by neighboring molecules. Experiments were made with crystals of anthracene and CsI(Tl) to test the validity of this theory. Alpha particles from Po^{210} impinged on the crystal surface at small angles and the tracks of ionizing particles were photographed. It was found that the difference of both density and total number of dots on the track plates depended only on the quantum luminescence yield of the crystals. These results were in sharp disagreement with the theory and with previous experiments which had seemed to verify it. (J.S.R.)

Electrical Discharge

7334 NYO-7977

New York Univ., New York. Atomic Energy Commission Computing and Applied Mathematics Center.

THERMONUCLEAR REACTION RATES IN AN ELECTRICAL DISCHARGE. Harold Grad. Jan. 23, 1958. 31p. Contract AT(30-1)-1480. $6.30(ph OTS); $3.00(mf OTS).

The ion distribution function in a plasma carrying current (e.g. in a pinch discharge) is not Maxwellian, and this fact must be taken into account in computing the thermonuclear reaction rate. In particular, it is the (non-) Maxwellian tail of the distribution which is vital to this computation. However, the conventional method of computing the distribution is legitimate only for the bulk of the distribution. This is good enough for the computation of transport coefficients but not for the computation of thermonuclear output. An asymptotic expression is derived for the tail of the ion distribution; the approximation is valid when the ratio of electron to ion mass is considered to be small and the electric field is not too large. The tail end of the distribution is found to depend exponentially on the value of the electric field, and depending on the numerical values, this result can deviate slightly or enormously from the Maxwell-averaged reaction rate. Since the reaction rate also varies very rapidly with temperature, an estimation of plasma temperature from observed values of neutron emission will not be greatly in error even if the computation is based on the incorrect Maxwellian distribution. It should also be kept in mind that an experimental temperature deduced in this way will be the maximum that is attained even if it exists only in a very small region of the plasma. (auth)

7335 AEC-tr-3124

RESONANCE METHOD FOR A DETERMINATION OF ELECTRON CONCENTRATION AND NUMBER OF COLLISIONS IN A DISCHARGE PLASMA. I. I. Wasserman. Translated from Zhur. Tekh. Fiz. 27, 516-21(1957). 10p.

A new radio-technical method is proposed for determining electron concentrations and the number of electron-atom collisions in the plasma of a gaseous discharge. (auth)

7336 AEC-tr-3146

THE GYRO-RELAXATION EFFECT. A. Schlüter. Translated from Z. Naturforsch. 12a, 322-5(1957). 12p.

It is shown that a relaxation of the degrees of freedom of the motion along the lines of force of a magnetic field relative to those of the gyration around these lines always occurs if the strength of the magnetic fields changes with time or along the trajectories. This relaxation causes an increase in the temperature of a plasma, even if the magnetic field changes are periodic, and may represent a convenient heating mechanism for achieving extreme temperatures. (tr-auth)

7337 AEC-tr-3147

OSCILLATIONS OF A PLASMA CYLINDER IN AN EXTERNAL MAGNETIC FIELD. K. Körper. Translated from Z. Naturforsch. 12a, 815-21(1957). 21p.

The oscillations of a plasma cylinder of infinite length were analyzed. The plasma is assumed to be homogeneous and to be exposed to a static homogeneous magnetic field in axial direction. There are two different types of oscillations. In one case the induced current is parallel to the magnetic field, and is therefore not influenced by it. In the other case where the induced current is perpendicular to the field, two resonance frequencies exist. In the limit of small density and high magnetic field these are the gyrofrequencies of the ions and the electrons. The index of refraction for both types in the limit of small frequencies is that of the "hydromagnetic waves." From the basic equations the energy conservation theorem is derived. Besides the usual terms giving the electromagnetic radiation, Joule's losses, the electromagnetic energy density, it contains the kinetic energy of the ions and electrons of the plasma. (tr-auth)

7338 AEC-tr-3148

AXIAL-SYMMETRICAL SOLUTIONS OF THE MAGNETO-HYDROSTATIC EQUATION WITH SURFACE CURRENTS. L. Biermann, K. Hain, K. Jörgens, and R. Lüst. Translated from Z. Naturforsch. 12a, 826-32(1957). 20p.

It is proposed to consider solutions of the magneto-hydrostatic equation of axial symmetry in which the plasma is contained in a torus with circular cross-section. For mathematical simplification it is furthermore assumed that the electric currents flow exclusively at the surface of the plasma. For the case, that these currents are assumed to be given, a method is outlined by which it is possible to calculate the exterior magnetic field which together with the magnetic field produced by the given currents, satisfies the boundary conditions at the surface. This procedure is carried through for the case of purely azimuthal electric currents, first by an approximate method, then by an exact method. To a first approximation it is sufficient to superpose an homogeneous field parallel to the axis of symmetry. For the case that the given currents are in a meridional plane, it is seen that the boundary conditions can be satisfied only by the superposition of an additional current together with a suitable meridional exterior magnetic field. Therefore, in the case of axial symmetry at least one azimuthal component of the electric current is necessary. (tr-auth)

7339 AEC-tr-3150

AXIALLY SYMMETRICAL MAGNETOHYDRODYNAMIC EQUILIBRIUM CONFIGURATIONS. R. Lüst and A. Schlüter. Translated from Z. Naturforsch. 12a, 850-4 (1957). 14p.

The conditions for magnetohydrostatic equilibrium are studied in the case of axial symmetry. The magnetic field is divided into its meridional and its toroidal parts which are described by the scalar functions F and T, respectively. It is shown that the gas pressure p and the functions F and T have to be functions of each other. Taking in particular p(F) and T(F) as known relations, a differential equation for F is derived. The cases in which this differential equation is linear are considered and explicitly solved if furthermore T(F) = const. In a special case, the magnetic lines of force are calculated numerically and shown in a figure. Some remarks on the stability are added. (tr-auth)

7340

JAPAN REPORTS FUSION. Science 127, 634(1958) Mar. 21.

Physicists of Osaka University in Japan, directed by

Minoru Okada, report that they have obtained a thermonuclear fusion reaction comparable to that announced recently by Great Britain and the United States. A discharge chamber was operated at 85,000 volts and about 1.1 million amperes; a fusion reaction is believed to have occurred for a millionth of a second. It is estimated that the experiment produced temperatures of 1 million degrees Centigrade. (auth)

Electrons

7341 UCRL-8190
California. Univ., Berkeley. Radiation Lab.
IONIZATION ENERGY LOSS OF ELECTRONS AND THEIR RANGE IN LIQUID HYDROGEN. Frank S. Crawford, Jr. Feb. 24, 1958. 4p. Contract W-7405-eng-48. $0.50(OTS).

Ionization energy loss, dT/dx, of electrons in liquid hydrogen is tabulated for parameters applicable to bubble chamber operation. Ranges are also given. (auth)

7342
ON AN EXPANDED STRUCTURE OF THE ELECTRON. Ernest Joachim Sternglass. Compt. rend. 246, 1166-8 (1958) Feb. 24. (In French)

It is shown that the experimental results of the nucleon-electron diffusion at high energies are compatible with a purely electromagnetic expanded structure of the electron. (tr-auth)

7343
ON THE QUASI-CLASSICAL INTERPRETATION OF QUANTUM EFFECTS IN THE THEORY OF LIGHT EMITTING ELECTRON. A. A. Sokolov and I. M. Ternov (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 117, 967-70(1957) Dec. 21. (In Russian)

A quasi-classical interpretation is given to the quantum effects which should appear, according to the quantum theory, during the ultrarelativistic electron motion in magnetic field. (R.V.J.)

7344
COMBINED USE OF PRE- AND POSTACCELERATION TO STUDY THE SPECTRA OF VERY LOW ENERGY ELECTRONS. A. Juillard and M. A. Moussa (Institut de Physique Nucléaire, Lyon). J. phys. radium 19, 94-5(1958) Jan. (In French)

Pre- and postaccelerations are used in a double focusing β spectrometer to study the 0 to 3 kev energy range. It is applied to the 7 kev conversion line of Co^{57} and the spectrum of disintegration products of Pb^{212}. (tr-auth)

Gases

7345 BNL-3337
Columbia Univ., New York.
SOLUBILITY AND STRIPPING OF RARE GASES IN MOLTEN METALS. Final Report. June 30, 1955. 16p. For Brookhaven National Lab. Subcontract S-229. (CU-4-56-BNL-S229-Ch.E.) $3.30(ph OTS); $2.40(mf OTS).

The status of the work on solubility and stripping of xenon in molten bismuth at the end of the subcontract period is described. The experimental procedures have been improved to the point where they are entirely reliable. The results show the solubility of xenon in bismuth at 492°C to be 8×10^{-7} atom fraction at atmospheric pressure. Various theoretical predictions of the solubility range from 100 times this result to 10^{-17} times this result, are evidently entirely useless for obtaining reliable values. (auth)

7346 AEC-tr-3170
CONVECTION PROCESSES IN THE GAS CENTRIFUGE THERMAL CONVECTION IN A STRONG GRAVITATIONAL FIELD. Hans Martin. Translated from Z. Elektrochem. 54, 120-9(1950). 19p.

A treatment is given of the efflux of a gas between 2 plane parallel heated plates for the case in which the gravitational field inducing the convection is extremely strong (the centrifugal field of an ultracentrifuge). The amount of gas discharing per second, the temperature process between the plates, and the velocity profile of flow are calculated. Except for very small plate distances, the flow conditions prove to be fundamentally different from those which exist when the acting gravitational field is that of the earth. The results, which predict peculiar thermal convection effects in rapidly rotating hollow bodies, are discussed. The case in which the gas is enclosed between unequally tempered walls is also discussed briefly. Reference is made to some of the relationships to problems that occur in the practice of gas ultracentrifuging. (tr-auth)

7347
ON THE THEORY OF A REAL GAS WITH NONCENTRAL PARTICLE INTERACTION. A. E. Glauberman (I. Franko Lvov State Univ.). Soviet Phys. (Doklady) 1, 615-19(1956) Nov.-Dec.

The Bogoliubov distribution function method for groups of particles is used to construct a rigorous theory of real gases which takes into consideration not only the central interaction but all forms of orientation interaction. (J.S.R.)

7348
ON THE STRUCTURE OF THE FRONT OF STRONG SHOCK WAVES IN GASES. Iu. P. Raizer (Academy of Sciences, USSR). Soviet Phys. JETP 5, 1242-8(1957) Dec. 15.

The internal structure of the front of strong shock waves is investigated, taking account of radiation. Approximate solutions of the equations of the mode are found. Profiles of the hydrodynamic quantities, density and radiation flux, are constructed. (auth)

Instruments

7349 NP-6621
Marquardt Aircraft Co., Van Nuys, Calif.
A REVIEW OF HIGH TEMPERATURE IMMERSION SENSING DEVICES FOR IN-FLIGHT ENGINE CONTROL. Victor D. Sanders. Feb. 14, 1958. 34p. Project 153. Contract AF33(616)-3720. (TR-153-3).

This paper is concerned with sensing devices that may be used for thermal monitoring and control of modern aircraft propulsion units. Performance and service requirements that transcend some aspects of present flight requirements for such devices are described. The possibility of exploiting that pneumatic probe and the high temperature thermocouple to these ends is explored. Summaries are presented reviewing recent progress in the technical development of high temperature measurement by these methods. Typical performance and thermoelectric behavior of twenty metallic thermocouples that have been calibrated above the melting point of platinum are presented. Seven of these pairs have been taken above 4000°F, and nine additional combinations have been calibrated above 3500°F. A comparison is made of the calibration atmospheres, maximum outputs, estimated maximum errors, temperature ranges of calibration, and ultimate temperature ranges for all thermocouples reported herein. A review of methods and properties of refractory oxides suitable for thermocouple protection at high temperatures are presented. A qualitative intercomparison of these

materials is made by ranking them according to relative merit of features desirable for thermocouple protection and insulation in the subject application. (auth)

7350 NP-6629

Radiation Research Corp., New York.

NUCLEAR BATTERIES. Final Progress Report [for] August 15, 1957–November 15, 1957. John H. Coleman and Arthur P. Pinkerton. 32p. DA Project No. 3-99-09-000. Contract DA-36-039-SC-73115.

During this contract, the battery components (source, collector and enclosure) were tested separately to obtain general design data and batteries constructed to test these principles. In regard to components, first, tritium-titanium sources were prepared and tested for helium 3 and tritium evolution. Tests using a mass spectrograph indicate no measurable evolution after 67 days. Tests using an ion chamber indicate model R life is 32,000 days at room temperature and 2,000 days at 75°C and R2 life is 930,000 days at room temperature and 5,200 days at 75°C. Secondly, a new electrophoresis process was developed to deposit the carbon collector with a minimum of impurities. Thirdly, enclosures for Models R and R2 types were designed and drawn from flat CRS with copper plating. In regard to battery models, two types (RS and R2S) were designed for 1000°C processing. Also electrical data were taken which indicated Model R and R2 output current as a function of internal gas pressure. (auth)

7351

A NUCLEAR MAGNETOMETER. G. S. Waters and P. D. Francis (Signals Research and Development Establishment, Christchurch, Hants, Eng.). J. Sci. Instr. 35, 88-93 (1958) Mar.

The basic principles of the nuclear free precession magnetometer are briefly described, and full details given of the coils, switching circuits and transistorized amplifying equipment of such a magnetometer. Accuracy of absolute measurement of the earth's total field is ±10 μG, and even better when only relative measurements are required. Setting-up of the instrument, which requires no calibration, and taking a reading takes only a few seconds. Suggestions are put forward for possible further applications of the free precession technique. (auth)

7352

800 KV CASCADE GENERATOR IN THE DIVISION OF ATOMIC PHYSICS OF THE CENTRAL SCIENTIFIC INSTITUTE OF PHYSICS. Imre Merey. Magyar Fiz. Folyoirat 3, No. 5-6, 489-96(1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 2980).

7353

TEMPERATURE DETERMINATION IN FLAMES BY X-RAY ABSORPTION USING A RADIOACTIVE SOURCE. George J. Mullaney (General Electric Research Lab., Schenectady, N. Y.). Rev. Sci. Instr. 29, 87-91(1958) Feb.

A radioactive source Fe^{55} was used to measure the density of high-temperature combustion products through a flame zone 6.5 cm long. Premixed propane–oxygen and argon were used for the experiments with a porous metal burner. Temperatures were determined downstream of the main reaction zone in the flame at one atmosphere. Temperature profiles were obtained through the preheat and main reaction zone using radioactive Fe^{55} coated on a small platinum wire as a line source. (auth)

7354

APPARATUS FOR PRECISION FLASH RADIOGRAPHY OF SHOCK AND DETONATION WAVES IN GASES. Herbert T. Knight and Douglas Venable (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 29, 92-8(1958) Feb.

An apparatus is described which is based on the technique introduced by Kistiakowsky utilizing the absorption of soft x-rays to measure densities behind gaseous shock and detonation waves. Experimental conditions leading to the smallest absorption statistical uncertainty consistent with maximum sensitivity are defined. These may be approximated at reasonable pressures and tube diameters by adding a strongly absorbing rare gas diluent to the experimental gas mixture. Under such conditions measured densities are accurate to ±1%, as demonstrated by comparison of experimental and calculated densities for shock waves in krypton. At some sacrifice in accuracy, space resolution of 1 mm and time resolution of 1 μsec may be achieved. A continuously pumped, laboratory-built, demountable, pulsed x-ray tube with an L-cathode and tungsten target is used at an accelerating voltage of 20 to 30 kv to obtain currents up to 0.2 amp for durations of the order of 1 msec. Copper and chromium targets were also investigated. For calibration purposes the tube is operated at a steady current of ≈0.2 ma and detector signals are measured potentiometrically to obtain transmission as a function of gas density. (auth)

7355

CRYOSTAT FOR REACTOR IRRADIATION. C. C. Sartain and H. P. Yockey (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 29, 118-21(1958) Feb.

A cryostat for continuously bathing samples in liquid nitrogen or other heat transfer liquids during nuclear reactor irradiation has been constructed and successfully operated. The samples to be irradiated at low temperature are immersed in the heat transfer fluid which is high-purity liquefied nitrogen circulating in a closed system at a pressure greater than that of the atmosphere. The liquid is kept below its boiling point throughout its cycle by use of a heat exchanger located outside the reactor shield. The heat exchanger is cooled by commercial liquid nitrogen boiling at atmospheric pressure. Since oxygen and water vapor from the air cannot enter the closed pressurized system, no chemical explosions inside the nuclear reactor have occurred. Baths at other temperatures may be obtained by substituting suitable liquids for the high-purity nitrogen heat transfer fluid and by keeping the heat exchanger at the desired temperature. (auth)

7356

MILLIMICROSECOND PHOTOMULTIPLIER TESTS WITH OSCILLOSCOPE LIGHT PULSES. James E. Draper (Brookhaven National Lab., Upton, N. Y.). Rev. Sci. Instr. 29, 179-80(1958) Feb.

7357

APPARATUS FOR THE DETERMINATION OF ELECTRIC CONDUCTIVITY OF FUSED SALTS. V. N. Tsyss, V. F. Drobnin, A. I. Nikitin, and A. I. Savchenko (Kazan' Mining-Metallurgical Inst.). Sbornik Nauch. Trudov Kazan. Gorno-Met. 11, 166-70(1956). (Translated from Referat. Zhur. Khim. No. 2, 1957, abstract No. 4942)

A device for the determination of electric conductivity of fused salts is described in which the earphones usually utilized as the zero instrument of the Kohlrausch bridge have been replaced by an electronic system which has made it possible to increase considerably the accuracy of determination. Detailed instructions are provided for operating the device and a wiring diagram of the zero instrument is included. (tr-auth)

7358

ELECTRIC VIBRATION VISCOSIMETER. G. I. Leskov and G. D. Shevchenko. Zavodskaya Lab., 22, No. 4, 492-6 (1956). (Translated from Referat. Zhur. Khim. No. 2, 1957, abstract No. 4915)

An instrument suitable for determination of the viscosity

of metallurgical and welding slag at high temperature is described. The essential part of the instrument consists of a vertical iron rod suspended from leaf springs and capable of undergoing vertical oscillations. The lower end of the rod carries a probe with a refractory material tip which is immersed into the substance under study. The rod is located in a magnetic field produced by permanent magnets and two identical coils wound upon the rod in such a manner that their magnetic flux adds up. The coils are connected to the primaries of a differential transformer; the currents in the coils are directed toward each other. The secondary winding of the transformer includes an electromeasuring instrument. When alternating current is passed through the system the rod oscillates at a frequency equal to that of the current, and an amplitude which depends on the viscosity of the liquid under study into which is immersed the tip. It is shown by calculations that the angle of deflection of the instrument pointer is directly proportional to the amplitude of oscillations of the rod and is inversely proportional to the viscosity of the liquid. There are included calibration curves recorded at different voltage of the feed current. (tr-auth)

Isotopes

7359

PRODUCTION AND UTILIZATION OF ELECTROMAGNETICALLY ENRICHED ISOTOPES. A. Bisi. Energia nucleare (Milan) 5, 85-9(1958) Feb. (In Italian)

This paper describes the characteristics of electromagnetic isotope separators (calutron) and the utilization of electromagnetically enriched isotopes. The activity performed in this field by the Physics Institute of the Milano Polytechnic is also mentioned. (auth)

7360

ON THE DISTRIBUTION OF MECHANICAL AND MAGNETIC NUCLEAR MOMENTS IN ISOTOPE SYSTEMS. Ye. P. Pzhigov (Academy of Sciences, USSR). Soobshcheniya Dal'nevostoch. Filosof. Akad. Nauk S.S.S.R. 8, 14-19(1955). (Translated from Referat. Zhur. Khim. No. 3, 1957, abstract no. 7396).

An attempt is made to systematize known data on the determination of the values of the mechanical and magnetic moments of various isotopes. (auth)

7361

HALF-LIFE OF Ag^{110}. V. I. Breslav (Academy of Sciences, Latvian, SSR). Latvijas PSR Zinātnu Akad. Vēstis No. 6, 97-8(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11082)

The decay of gamma-active Ag^{110} produced according to reactions (d,p) and (n) was investigated. $T_{½}Ag^{110}$ was measured by the method of differential ionization chambers. As standard of comparison Co^{60} was used. $T_{½}$ was calculated. Ag^{110} was prepared in the form of metal foil. Measurement was carried out for 3 months. $T_{½}$ was found to be 288.7 ± 2.0 days. The result obtained is at variance with data on measurement of $T_{½}(Ag^{110})$ by means of Geiger-Mueller counters.

7362

ENRICHMENT OF RADIOACTIVE ISOTOPES OF IODINE, GERMANIUM, ARSENIC, AND ANTIMONY BY (γ,n) REACTIONS. A. N. Murin, V. D. Nefedov, V. I. Baranovskii, and D. K. Popov (V. G. Khlopin Radium Inst., Academy of Sciences, USSR and A. A. Zhdanov Leningrad State Univ.). Soviet Phys. (Doklady) 1, 719-21(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3936.

Isotope Separation

7363 IGRL-T/CA-55

A PROCESS FOR SEPARATING GASEOUS MIXTURES OF ISOTOPES AND ITS APPLICATION TO THE ISOTOPES OF NEON. G. Hertz. Translated by B. Rigby from Z. Physik 79, 108-21(1932). 13p.

The process employs diffusion through a porous wall into a vacuum. It is possible to use a large number of diffusion stages simultaneously and, therefore, to separate a mixture of isotopes completely in a single operation. The apparatus, consisting of 24 pumps and 48 ceramic tubes, produced, in one operation, a change in the isotopic ratio of neon by a factor of nearly 8. By repeated processing a further separation is possible. The different compositions of the mixtures of neon isotopes were characterized by mass spectroscopy and optical spectra. (auth)

7364

CONCENTRATION OF ISOTOPES BY ELECTROMIGRATION IN AQUEOUS SOLUTION: INFLUENCE OF TEMPERATURE ON THE RELATIVE DIFFERENCE OF MOBILITY OF THE $(Rb^{85})^+$ AND $(Rb^{87})^+$ IONS. André Bonnin and Marius Chemla. Compt. rend. 246, 1189-92(1958) Feb. 24. (In French)

The relative difference of the mobility of univalent ions of Rb^{85} and Rb^{87}, in aqueous solution, was studied as a function of temperature by electromigration on paper. The difference increases from 1.1×10^{-3} at 3°C to 1.7×10^{-3} at 48°C. (tr-auth)

7365

THE POSSIBILITIES OF APPLYING MULTIPLE MONOCHROMATIZATION TO THE ELECTROMAGNETIC SEPARATION OF ISOTOPES. Charles Cassignol. Compt. rend. 246, 1413-16(1958) Mar. 3. (In French)

A theory of isotopic contamination suggested primarily by experimentation with a double electrostatic monochromatization apparatus gives by numerical application to other systems of multiple monochromatization some isotopic enrichment values which are greater by several orders of magnitude than the values obtained today. (J.S.R.)

Mass Spectrography

7366

THE RADIO FREQUENCY MASS SPECTROMETER AS AN ANALOGUE TO THE OPTICAL GRATING. I. Cornides (Eotvos Univ., Budapest). Acta Phys. Acad. Sci. Hung. 5, No. 4, 471-82(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3000).

Analysis of the basic laws that apply to the radio-frequency magnetless mass spectrometers built by Bennett (Bennett, W. H., Journal of Applied Physics, 1950, 21, 143) and Redhead (Referat. Zhur. Fiz. 1955, 4169) shows a formal analogy between these two instruments and optical spectrometers with diffraction gratings. The Redhead instrument is an equidistant radio-frequency mass spectrometer and the equations valid for it can be derived from the equations of a simple optical grating. The Bennett instrument is the analogue of a spectrometer with a non-equidistant grating. Comparison of the Fraunhoffer diffraction from one and two slits with the operation of one and two stages of a radio-frequency mass spectrometer shows the analogy between the diffraction angle and the frequency of the electric field of the stages, and also between the wavelength of light and the velocity of the particles. The distances between the grids of a radio frequency stage correspond in the equation to a constant diffraction grating. This serves as the starting point for further

analogies, which make it possible to produce a multi-stage instrument, using the relationship for a multi-slit grating. The difficulties caused by the variable grating parameter can be eliminated by solving this problem graphically with the aid of a specially constructed instrument. The principle of construction of this instrument, which adds vectorially the amplitudes of the energy increments in each of the stages, is given. This makes it possible to choose a combination of cyclic numbers, chosen by Bennett empirically. Photographs are shown of the spectra with Na^+ and K^+ lines, made with Redhead and Bennett instruments with the same number of stages, showing the considerably higher resolving power of the latter. (auth)

7367

MOLECULAR ION DISSOCIATION BY THIN FILMS. F. A. White, F. M. Rourke, and J. C. Sheffield (Knolls Atomic Power Lab., Schenectady, N. Y.). Rev. Sci. Instr. 29, 182(1958) Feb.

One of the fundamental limitations in mass spectrometry arises in attempts to differentiate between atomic and nuclear ions having the same charge to mass ratio. Partial dissociation of complex ions in a mass spectrometer has been observed. By using a three-stage mass spectrometer, complete dissociation of molecular ions has been achieved. The film acts as a strong force field at a discrete point in the beam trajectory causing uncorrelated forces to act on the constituent atoms of the molecules. Further experiments are in progress utilizing these films as well as thin nickel films. (A.C.)

Mathematics

7368 AECU-3647

Illinois. Univ., Urbana. Digital Computer Lab.
TECHNICAL PROGRESS REPORT. PART I. HIGH-SPEED COMPUTER PROGRAM. PART II. SWITCHING CIRCUIT THEORY. PART III. MATHEMATICAL METHODS. PART IV. ILLIAC USE AND OPERATION—GENERAL LABORATORY INFORMATION. Jan. 1958. 25p. $4.80 (ph OTS); $2.70(mf OTS).

(For preceding period see AECU-3640.)

7369 WAPD-T-538

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh,]
ON THE APPLICATION OF MULTIVARIANT ANALYSIS TO NUCLEAR DESIGN. J. M. McCampbell. [1957?]. 11p. $3.30(ph OTS); $2.40(mf OTS).

A method of optimizing reactor properties based on statistics is suggested and illustrated with an example. The well known theory of experimental designs is used as a guide to determine what nuclear design problems should be solved on digital computers. Results of these problems are then fitted with an empirical equation that is optimized mathematically. Analysis of errors shows that they do not influence the conclusions in the examples. (auth)

7370

USE OF THE MONTE CARLO METHOD FOR THE DETERMINATION OF THE CRITICAL VOLUMES OF A CYLINDER. Gérard Bouquet, Marc Feix, Paul Nicourd, and Cécile Sajaloli. Compt. rend. 246, 1382-4(1958) Mar. 3. (In French)

The authors study the Monte Carlo method applied to a problem of the calculation of a critical volume of fast neutrons in a complex geometry (finite cylinder). The combination of the theoretical methods and practical observations concerning the calculation with electronic machines gives good precision. It is known that the yield of the Monte Carlo method increases with the complexity of the problem. (tr-auth)

Measuring Instruments and Techniques

7371 NARF-58-12T

Convair, Fort Worth, Tex.
MODIFIED MULTICHANNEL ELECTROMETER SYSTEM. B. M. Lasater. Mar. 5, 1958. 37p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-193).

The multichannel electrometer system originally designed for use in the Nuclear Test Airplane has been modified to eliminate zero-drift caused by temperature differences between two widely separated electrometer tubes. The modification was accomplished by locating the tubes close together in the main electrometer chassis, so that temperature differences causing zero-drift are minimized. The modified system will monitor 12 points simultaneously. Each channel has five current ranges, each of which has full-scale readings of 3×10^{-6} amp ±1%, 3×10^{-7} amp ±1%, 3×10^{-8} amp ±1%, 3×10^{-9} amp ±2%, and 3×10^{-10} amp ±2%. The zero-drift of each channel after warm-up is less than 1% of full scale in 12 hours. The electrometer system consists of the electrometer control unit, the main electrometer unit, and the range unit—each built into a separate chassis. It is designed to occupy a minimum of space. An instrument rack equipped with casters and wired to fit the system gives the system the mobility required for laboratory use. (auth)

7372 AEC-tr-3154

CHARACTERISTICS AND OPERATING MECHANISM OF GERMANIUM–HOLE ALPHA COUNTERS. A. V. Airapetyants and S. M. Ryvkin (Rykin). Translated from Zhur. Tekh. Fiz. 27, 95-105(1957). 16p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 6478.

7373

THE APPLICATION OF RADIATION IN AUTOMATIC CONTROL DEVICES. Yu. V. Gushchin, L. V. Melttser, and M. I. Tolokonnikov. Avtomat. i Telemekh. 18, No. 9, 814-40(1957).

The utilization of nuclear radiation in automatic control devices in the USSR is reviewed. Typical methods of using these devices are analyzed. The basic characteristics of α, β, and γ radiation are investigated and described. The most frequently used reception devices for the transformation of radiation into electrical energy, such as the ionization chamber, the Geiger tube, and the scintillation counter, are described. Various control devices used in industry are reviewed. The future development of automatic control is discussed. (J.S.R.)

7374

REPRODUCTION OF THE "ROENTGEN" UNIT FOR GAMMA RAYS WITH THE AID OF AN EXTRAPOLATION CAMERA. Ya. L. Shekhtman and G. B. Radziyevskiy (Inst. of Biological Physics, Academy of Sciences, USSR). Biofizika 1, No. 3, 206-10(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3056).

A description is given of the construction of ionization chambers of the extrapolation type, suitable for reproducing a roentgen unit of gamma rays. It is noted that the chamber can serve for calibration of dosimeters. (auth)

7375

CORRELATION BETWEEN BLACKENING OF PHOTOGRAPHIC EMULSION AND ENERGY OF BETA-RADIATION. Miroslav Rozkos and Vaclav Petrzilka. Chekhoslov. Fiz. Zhur. 6, No. 3, 237-45(1956). (Translated from Referat. Zhur. Khim. No. 4, 1957, abstract No. 11318).

7376

MEASUREMENT OF VERY SMALL TIME INTERVALS.

E. Gatti. Energia nucleare (Milan) 5, 91-4(1958) Feb. (In Italian)

The paper deals briefly with time measurement of short intervals between nuclear events. Fundamental limits of time resolution with scintillation counters are quoted. Some principles of new developments in electronic instruments are illustrated. (auth)

7377

CONTROL OF RADIOACTIVE GAS. Robert and Flachs. Ind. Atom. 2, No. 3-4, 82-5(1958). (In French)

A description is given of an instrument designed to monitor the radioactivity in the air in the vicinity of nuclear reactors. It gives an instantaneous alarm at the occurrence of any increase in radioactive aerosols. (J.S.R.)

7378

A SIMPLE MONITOR FOR AIRBORNE ALPHA PARTICLES. R. D. Hiebert, R. N. Mitchell, and D. B. Tod (Los Alamos Scientific Lab., N. Mex.). IRE Trans. Nuclear Sci. Ns-4, 66-9(1957) Dec.

A simple continuous monitor for airborne alpha particles is described. The single-channel system can detect activity concentrations of ten times maximum permissible level for plutonium and gives indication of accumulated activity at 10-minute intervals. The instrument is designed with emphasis on simplicity, reliability, flexibility of use, and ease of decontamination. (auth)

7379

MECHANICAL SELECTION OF SLOW NEUTRONS. B. Jacrot and G. Gobert (C. E. N., Saclay, France). J. phys. radium 19, 82(1958) Jan. (In French)

A mechanical selector of slow neutrons is described. It uses selection by time-of-flight between two wheels. (tr-auth)

7380

A TIME OF FLIGHT SELECTOR OF FAST NEUTRONS. Ernst Remy and Klaus Winter (Collège de France, Paris). J. phys. radium 19, 96-7(1958) Jan. (In French)

A fast coincidence circuit and time-sorter is described, designed for time-of-flight measurements of fast neutrons. The zero-time is established by the associated particle method. (tr-auth)

7381

SOME RESULTS CONCERNING GASEOUS SCINTILLATORS AND THEIR CONDENSED STATE. L. Koch and R. Lesueur (Centre d'Études Nucléaires, Saclay, France). J. phys. radium 19, 103-5(1958) Jan. (In French)

The essential characteristics of rare gases for use as scintillators are a very brief period of luminescence, generally less than 10^{-8} sec, and a linear response as a function of the energy lost by the nuclear particle in the gas, even in the case of strongly ionizing particles. In the gaseous or condensed state, therefore, they are of great interest in nuclear physics. (tr-auth)

7382

METHODS OF MEASURING RADIOACTIVE RADIATIONS. Alex Sanielevici. Metrol. Apl. 3, No. 3, 7-11(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3031).

A description is given of the conventional measurement methods and doses of radioactive substances with the aid of Geiger-Mueller counters. (auth)

7383

MEASURING VERY HIGH TEMPERATURES. A. A. Ware. New Scientist 3, No. 68, 30-3(1958) Mar. 6.

The measurement of the temperatures obtained in ZETA and SCEPTRE require special techniques. The energy distribution of the particles does not follow the Maxwellian distribution and the presence of the electric and magnetic fields may mean that the electrons have a different average energy than the positive ions. Hence, a double measurement of the electron temperature and the ion temperature must be made. The most successful method of measuring ion temperatures is based on careful observation of the wavelength of the light given out by the positive ions. The Doppler effect causes a broadening of the sharp spectral lines. The other main method of measuring ion temperature is based on the nuclear reactions which take place at high temperatures when heavy hydrogen is the gas. The reaction rate varies very rapidly with temperature. Electron temperature is more difficult to measure at these high currents and temperatures. The best method, spectroscopy, yields only a qualitative indication of electron temperature. As none of these methods for either ions or electrons is valid, in practice all methods are used simultaneously to obtain fairly definite conclusions about the temperature of the hot gas. (J.S.R.)

7384

CERN MEETING ON NUCLEONIC INSTRUMENTATION FOR HIGH ENERGY PHYSICS. G. von Dardel, ed. Nuclear Instr. 2, 70-218(1958) Feb.

Thirty papers are included on nanosecond techniques, counting and storage systems, information handling systems and other problems of big experiments, transistor circuits, and standardization of nuclear equipment. (M.H.R.)

7385

IODINE-VAPOR-FILLED ULTRAVIOLET PHOTON COUNTER. R. T. Brackmann, W. L. Fite, and K. E. Hagen (General Dynamics Corp., San Diego, Calif.). Rev. Sci. Instr. 29, 125-8(1958) Feb.

A device for the sensitive detection of ultraviolet radiation in the range 1080 to 1260 A is described. This device is a Geiger-Mueller counter in which the counts are initiated by the photoionization of iodine vapor used in the tube's filling. The range of response is determined by the ionization potential of iodine and the short wavelength cutoff of LiF, through which radiation enters the counter. Because of iodine vapor in the filling, the electrical characteristics of the tube are those of a halogen-quenched counter. (auth)

7386

PULSED CYCLOTRON METHOD FOR 2-25 Mev NEUTRON SPECTROSCOPY. James E. Draper (Brookhaven National Lab., Upton, N. Y. and Yale Univ., New Haven). Rev. Sci. Instr. 29, 137-42(1958) Feb.

A method is described for obtaining short intense bursts (5 μsec and 10 to 20 ma) of 22-Mev deuterons at a repetition rate of 500 cps. The cyclotron arc is pulsed on for 1 μsec, and one of the approximately ten circulating phase-grouped beam bunches is selected for deflection onto the external cyclotron target by means of a 50 μsec pulse on the cyclotron deflector. Using a 12.5 meter flight path the resulting radiations were analyzed. Investigations of backgrounds showed them to be less than one percent. (auth)

7387

LIQUID SCINTILLATORS FOR FREE NEUTRINO DETECTION. A. R. Ronzio, C. L. Cowan, Jr., and F. Reines (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 29, 146-7(1958) Feb.

The criteria by which liquid scintillators have been selected and developed for free neutrino detection experiments are described and a discussion is given of the preparation of the solutions. Triethylbenzene is a superior solvent and cadmium octoate is found to be the best cadmium compound known for these purposes. (auth)

7388

ADVANCES IN THE STANDARD PROPORTIONAL COUNTER METHOD OF FAST NEUTRON DOSIMETRY. E. B. Wagner and G. S. Hurst (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 29, 153-8(1958) Feb.

The proportional counter method for measuring fast neutron dose in the presence of gamma radiation has been considerably improved through (1) redesign of the proportional counter, (2) a study of the behavior of the counter for various filling gases, and (3) development of a more convenient form of the electronics necessary for pulse integration and dose indication. The instrument is suitable for radiobiological research, neutron physics, and shielding research, as well as radiation protection. It will be shown that the response of the instrument is within ±5% of tissue absorbed dose over the energy range of 0.5 to 14 Mev. (auth)

7389

FLUOROCARBON GAS BUBBLE CHAMBER. Beat Hahn and Georg Riepe (Univ. of Fribourg, Switzerland). Rev. Sci. Instr. 29, 184-5(1958) Feb.

In the search for a suitable gas-liquid system for bubble chambers fluorocarbons were found to have very favorable properties. An experimental bubble chamber which has been successfully operated with an ethforane (C_2F_6)–propforane (C_3F_8) gas-liquid system is described. (A.C.)

7390

DETERMINATION OF MASS OF SLOW CHARGED PARTICLES IN PHOTOGRAPHIC PLATES. M. I. Tret'iakova (P. N. Lebedev Physical Inst., Academy of Sciences, USSR). Soviet Phys. JETP 5, 1045-55(1957) Dec. 15.

The accuracy of various methods of determination of the masses of slow charged particles stopped in photographic plates is examined. It is shown that for reliable identification of an individual particle it is not sufficient to determine its mass by only one method. Distributions in mass of slow charged particles (E < 30 Mev) produced by ~460 Mev protons are presented, the masses being determined by different methods. The mass and charge sign distributions have been obtained by the magnetic deflection-range method for slow particles (E < 50 Mev) created by cosmic rays at an altitude of ~9.5 km. (auth)

7391

ON BUBBLE CHAMBERS. P. V. Vavilov. Soviet Phys. JETP 5, 1276(1957) Dec. 15.

The mechanism of bubble formation incident to the passage of particles through a superheated liquid still remains unclear. Many authors consider that the bubbles are due to electrostatic repulsion of positive ions produced by ionizing particles and that the thermal process in the formation of the bubbles can be neglected. In this study it is assumed that the thermal process is the predominant one in bubble formation. (A.C.)

7392

USE OF A MIXTURE OF TWO LIQUIDS IN BUBBLE CHAMBERS. G. A. Blinov, Iu. S. Krestnikov, M. F. Lomanov, and Ia. Ia. Shalamov. Soviet Phys. JETP 5, 1281-2(1957) Dec.

Technical difficulties are encountered in the operation of bubble chambers because of the necessity of producing and maintaining temperatures and pressures appropriate to the liquid employed. These difficulties could be largely obviated if it were possible to work at close to room temperature. It is assumed that a convenient working temperature could be obtained using appropriate mixtures of two liquids. The results of experiments with bubble chambers filled with a mixture of two liquids are discussed. (A.C.)

7393

METHOD AND RESULTS OF SCINTIGRAPHY AFTER A DOSE OF RADIOISOTOPES. Paul Doering (Der Medizinischen Klinik der Universität Göttingen, Germany). Strahlentherapie 105, 101-6(1958). (In German)

The author outlines the method of scintigraphy as it is used at the Medical Clinics in Göttingen. A summary of critical observations on discourses concerning polycythemia vera is included. (auth)

7394

GAMMA DEFECTOSCOPE WITH SCINTILLATION COUNTER. I. G. Fakidov and A. A. Samokhvalov. Zavodskaya Lab. 22, No. 6, 673-7(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3949).

The use of scintillation counters in gamma defectoscopy has many advantages both compared with the photography method of recording the radiation, and compared with defectoscopes with Geiger-Mueller counters in that it has a higher sensitivity and speed of control and that continuous control of a moving object is possible. A defectoscope was designed for the control of articles with a thickness up to 250 to 300 mm. The defectoscope is quite stable and its indications are readily reproducible. The sensitivity of the instrument is 2 to 2.5%. (auth)

7395

ON THE ENERGY RESOLUTION OF SCINTILLATION COUNTERS. L. S. Kukushkin and A. M. Ratner (Inst. of Chemical Reagents, Kharkov). Zhur. Tekh. Fiz. 28, 345-50 (1958) Feb. (In Russian)

The dispersion of light emitted from various crystal positions was studied as a component part of the scintillation counter dispersion. Calculations were made of sodium iodide cylindrical crystals of various shapes and dimensions. The effects of the optical contact between the crystal and the photomultiplier on the light capture were investigated. The curve obtained for the emitted light dispersion strongly differs from the Gaussian curve which contributes new data for counter dispersion. (tr-auth)

Mesons

7396

EXPERIMENTAL STUDY OF HELICOIDAL QUADRUPOLAR LENSES FOR FOCUSING μ MESONS. Mario Morpurgo and Albert Septier. Compt. rend. 245, 2496-9(1957) Dec. 23. (In French)

It is shown experimentally that a new system of strong focusing formed of long quadrupolar lenses, helically shaped, allows the channeling of particles along a great length and presents some interesting properties of speed divergences. The system can be used to channel μ mesons. (tr-auth)

7397

DISPERSION RELATIONS FOR INELASTIC SCATTERING. T. W. B. Kibble (Univ. of Edinburgh). Proc. Roy. Soc. (London) A244, 355-76(1958) Mar. 25.

A derivation of the dispersion relations for the inelastic process in which one meson is scattered on a nucleon into several mesons is presented. The case of two outgoing mesons is treated rigorously and in detail. The method used is based on that of Bogolyubov, Medvedev, & Polivanov (1956) for non-forward elastic scattering, and a mathematical theorem assumed here is a generalization of a theorem stated by them. (auth)

7398

INVARIANTS IN $K_{\mu 3}$ AND K_{e3} DECAYS. R. Gatto (Univ. of California, Berkeley). Progr. Theoret. Phys. (Kyoto) 19, 146-52(1958) Feb.

A discussion is given of the $K_{\mu 3}$ and K_{e3} decay modes, making use of the invariance properties of the theory, under the general hypothesis of parity nonconservation and lepton nonconservation. The assumption of local interaction between the final fermions is examined in detail. Detection of a possible updown asymmetry, with respect to the $K_{\mu 3}$ decay

plane, of the electrons from the subsequent μ decay is suggested as a possible test of time reversal. (auth)

7399

DISPERSION RELATIONS FOR PHOTOPRODUCTION OF PIONS ON NUCLEONS. A. A. Logenov and A. N. Tavkhelidze. Soviet Phys. JETP 5, 1134-44(1957) Dec. 15.

Dispersion relations are derived for pion photoproduction reactions on nucleons. The spin and isotopic structure of the reaction amplitude is established, and the unobservable energy range is separated. It is shown that the dispersion relations are inhomogeneous. (auth)

7400

MESON-MESON SCATTERING IN MESON FIELD THEORY. V. V. Sudakov. Soviet Phys. (Doklady) 1, 662-5(1956) Nov.-Dec.

The natural pseudoscalar meson theory is used to derive a simple closed expression for amplitude P which is dependent on only a single argument. (J.S.R.)

7401

TOWARDS A GENERAL THEORY OF MESON SCATTERING. A. Brodskii (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 1, 701-4(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3980.

7402

SCATTERING OF POSITIVE AND NEGATIVE 300-Mev PIONS BY HYDROGEN. L. S. Dul'kova, I. B. Sokolova, and M. G. Shafranova (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 739-42(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 6136.

7403

PHOTOPRODUCTION OF SLOW π^- MESONS IN COMPLEX NUCLEI. E. G. Gorzhevskaia and N. M. Panova (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 757-60(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 5982.

7404

PRODUCTION OF π^+ MESONS IN p-p COLLISIONS AT 480-660 Mev. B. S. Neganov and O. Savchenko (Joint Inst. for Nuclear Research). Soviet Phys. JETP 5, 1033-41(1957) Dec. 15.

The energy distributions of π^+ mesons from the reactions $p + p \rightarrow \pi^+ + n + p$ and $p + p \rightarrow \pi^+ + d$ have been measured at four laboratory system angles utilizing an external beam of 660 Mev protons. The differential cross section for π^+ meson production has been measured at eight laboratory system angles. The total cross section for the first reaction is (10.9 ± 1.1) mb and the angular distribution is proportional to $(0.66 \pm 0.14) + \cos^2 \theta$. The excitation function of this reaction is given in the energy region 480 to 660 Mev approximately by the power law $0.67\ p_{max}^{4.7}$ mb, where P_{max} is the maximum meson momentum in units of $m_{\pi^+}c$ in the center-of-mass system. (auth)

7405

PION PRODUCTION IN ZERO ISOTOPIC SPIN NUCLEI. A. G. Meshkovskii, Iu. S. Pligin, Ia. Ia. Shalamov, and V. A. Shebanov. Soviet Phys. JETP 5, 1085-9(1957) Dec. 15.

The energy spectra and differential cross section for the production of π^+ and π^- mesons in deuterium and of π^- mesons in carbon by 600-Mev protons were measured at 45°. Comparison of the data on the production of charged and neutral pions confirms the correctness for deuterium and carbon of the relation $d\sigma^+ + d\sigma^- = 2d\sigma^0$ which follows from the hypothesis of isotopic invariance for zero isotopic spin nuclei. (auth)

7406

CORRELATIONS IN $\pi \rightarrow \mu \rightarrow e$ DECAY. A. O. Vaisenberg and V. A. Smirnitskii (Academy of Sciences, USSR). Soviet Phys. JETP 5, 1093-6(1957) Dec. 15.

Positrons from $\pi \rightarrow \mu \rightarrow e$ decays in emulsion were analyzed by energy and by the angle between μ-meson and positron tracks. The observed distributions are in qualitative agreement with the two-component neutrino theory. If λ is the theoretical asymmetry parameter and α the fraction of the μ mesons not depolarized by the emulsion, the measurements give the result $\alpha\lambda = 0.5 \pm 0.25$. (auth)

7407

DISPERSION RELATIONS FOR THE PHOTOPRODUCTION OF PIONS. A. A. Logunov and B. M. Stepanov (V. A. Steklov Mathematics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 552-4(1956) Sept.-Oct.

The Bogoliubov method is used to set up dispersion relations for photoproduction of pions. (J.S.R.)

7408

DECAY OF NEUTRAL HEAVY MESON. Gan'chan Van, Tszyan Syao, and Zhen'tsi' LyuyMin' Chzhen. Uli Syuebao Acta Phys. Sinica 11, No. 6, 493-7(1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3154).

7409

THE MULTIPLE MESON PRODUCTION IN NUCLEON-NUCLEON COLLISIONS AND IN NUCLEON-ANTINUCLEON ANNIHILATION. Martin Kretzschmar. Z. Physik 150, 247-63(1958). (In German)

An investigation was made to determine which form of Fermi's statistical theory on multiple meson production to use when the random parameter is so defined that the calculation of the average energy of the π mesons produced by antiproton annihilation is correct. It was found that the statistical theory describes antiproton annihilation well and that also the form of meson production in nucleon-nucleon collisions was in much better agreement with experimental data than was Fermi's first calculation of the case. The average energy of the π meson deviated higher by a factor of 1.5 from experimental values. Their dependence on the primary energy was shown. (tr-auth)

7410

POTENTIAL CURVES AND ENERGY LEVELS OF THE μ-MESON MOLECULE $(pp)\mu$, $(dp)\mu$, $(dd)\mu$. H. Marschall and Th. Schmidt. Z. Physik 150, 293-8(1958). (In German)

It is shown that the Born-Oppenheimer approximation can lead to considerable errors in the μ meson molecule on account of the large μ meson mass. Consequently a method is proposed which permitted calculation of the potential curve and the energy levels. The results of the calculation are reported for the $(pp)\mu$, $(pd)\mu$, $(dd)\mu$ molecule. (tr-auth)

7411

THE CALCULATION OF THE NUCLEAR QUADRUPOLE SCATTERING OF POSITIVE MUONS IN THE WEAK RELATIVISTIC ENERGY RANGE. J. V. Behr. Z. Physik 150, 311-24(1958). (In German)

For the scattering of positively charged muons by heavy nuclei the influence of the nuclear quadrupole moment on the scattering distribution was calculated. Under the assumption that the quadrupole potential approached the spherical symmetrical interaction, as well as that the spin-orbit coupling could be treated as a perturbation, the Dirac equation was solved by an approximation method which follows the Born calculation method but uses the wave field belonging to the spherically symmetrically interactions as the initial solution. The scattering distribution obtained was compared with that from the usual Born approximation calculations. (tr-auth)

Molecular Properties

7412
ON THE RELATION OF THE PHYSICAL PROPERTIES OF CRYSTALS TO MOLECULAR CONCENTRATION. P. A. Savintsev (S. M. Kirov Tomsk Polytechnic Inst.). Soviet Phys. (Doklady) 1, 591-3(1956) Sept.-Oct.

The relation between the molecular concentration, the ratio of the crystal density to the molecular weight, and various mechanical, thermal, and electrical properties was studied for crystals of alkali halides, magnesium oxide, strontium oxide, calcium oxide, and barium oxide. The results are tabulated. (J.S.R.)

7413
THE MOLECULAR STRUCTURE OF NIOBIUM PENTACHLORIDE. J. Guant and J. B. Ainscough (Atomic Energy Research Establishment, Harwell, Berks and United Kingdom Atomic Energy Authority, Salwick, Lancs., Eng.). Spectrochim. Acta 10, 52-6(1957) Nov.

The infrared and Raman spectra of niobium pentachloride have been measured. An interpretation of the spectra has been made in a manner consistent with the rigid selection rules for the trigonal bipyramid structure (D_{3h}) and the thermodynamic properties have been calculated on the simple harmonic oscillator approximation. An unsuccessful attempt has also been made to examine the infrared and Raman spectra of niobium trichloride and tetrachloride. (auth)

7414
THE MOLECULAR STRUCTURE OF ANTIMONY PENTAFLUORIDE. J. Gaunt and J. B. Ainscough (Atomic Energy Research Establishment, Harwell, Berks and United Kingdom Atomic Energy Authority, Salwick, Lancs., Eng.). Spectrochim. Acta 10, 57-60(1957) Nov.

The infrared and Raman spectra of antimony pentafluoride have been investigated. Five Raman lines were observed and have been assigned as fundamentals. An interpretation of the infrared spectrum has been made in a manner consistent with the rigid selection rules for the trigonal bipyramid structure (D_{3h}). The thermodynamic properties have been calculated on the simple harmonic oscillator approximation. (auth)

Neutrons

7415 HW-17331
Hanford Works, Richland, Wash.
TIME DEPENDENT ABSORPTION OF NEUTRONS BY PLANE SLABS. G. M. Muller. Mar. 30, 1950. Changed from OFFICIAL USE ONLY Jan. 14, 1952. 18p. Contract W-31-109-eng-52. $0.15(OTS).

7416
METHOD OF SUCCESSIVE GENERATIONS. G. W. Stuart and R. W. Woodruff (General Electric Co., Richland, Wash.). Nuclear Sci. and Eng. 3, 339-73(1958) Mar.

The behavior of neutrons within an absorbing rod is determined through an orders of scattering analysis. Application of the results to practical problems of reactor analysis is presented to illustrate the method's utility. Several comparisons between calculated and experimental quantities are included to check the theory's veracity. Tables of calculated results are presented. (auth)

7417
THE AGE OF POLONIUM-BORON NEUTRONS IN WATER. Melvin Reier (Westinghouse Electric Corp., Pittsburgh). Nuclear Sci. and Eng. 3, 374-5(1958) Mar.

The age to indium resonance of Po–B neutrons in metal–water lattices has been measured and compared with theory. (W.D.M.)

Nuclear Physics

7418 AFOSR-TR-58-25
Uppsala Univ. Inst. of Physics.
TECHNICAL REPORT [ON THE PROPERTIES AND BEHAVOR IN MATTER OF THE ANTIPROTONS, AND THE NEGATIVE K-MESONS]. [1958]. Includes reprint: A DECAY OF A NEGATIVE τ'. S. Nilsson. Nuclear Phys. 3, 364-6(1957). 28p. Contract AF61(514)-1015. (AD-152200).

In a nuclear emulsion stack exposed at the Bevatron, ten events were identified as due to antiproton annihilation. The interaction characteristics of these events and the scanning techniques used are reported. Two emulsion stacks were exposed to K^- mesons; however, only a partial scan of one stack is complete. Interactions found in this partial scan are included. (D.E.B.)

7419 AFOSR-TR-58-26
Uppsala Univ. Inst. of Physics.
TECHNICAL REPORT [FOR SEPTEMBER 1, 1956–AUGUST 31, 1957]. 16p. Contract AF61(514)-1015. (AD-152201).

The construction of an atomic beam resonance apparatus was completed and investigations of some radioactive bismuth isotopes were started. Brief descriptions of the apparatus and the measurements made are given. Conversion lines and a proposed decay scheme are given for the transition $Au^{194} \rightarrow Pt^{194}$. Gamma energies and a proposed decay scheme are also given for the $As^{76} \rightarrow Se^{76}$ transition. (D.E.B.)

7420
INVESTIGATION OF THE COULOMB EXCITATION OF THE SECOND LEVEL OF Pt^{194}. Roland Barloutaud, Tovy Grjebine, Pierre Lehmann, Antoine Lévèque, Jacques Quidort, and Georges M. Temmer. Compt. rend. 244, 187-90(1957) Jan. 7. (In French)

The absence of Coulomb excitation of the second level of Pt^{194} permits assigning to the reduced probability E_2 on upper limit eight times smaller than that given by considering the level as a vibration level. (tr-auth)

7421
INFLUENCE OF α RECOIL OF A NUCLEUS EMITTING INTERNAL CONVERSION ELECTRONS ON THE FORM OF THE ELECTRON SPECTRUM. Roger Foucher and Hamlet Vartapetian. Compt. rend. 246, 1031-4(1958) Feb. 17. (In French)

The deformation of a conversion electron caused by the α recoil of the emitting nucleus was studied. (J.S.R.)

7422
DIRECT INTERACTION IN NUCLEAR REACTIONS. C. T. de Dominics (C. E. N., Saclay, France). J. phys. radium 19, 1-7(1958) Jan. (In French)

A brief introductory account is given of the shortcomings of the compound nucleus model. The effects of processes involving interactions lasting a very short time are discussed. (tr-auth)

7423
CONCERNING THE SPIN OF THE Λ-PARTICLE. I. Yu. Kobarev and L. B. Okun. Zhur. Eksptl'. i Teoret. Fiz. 30, 798-9(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3148).

The non-meson Λ-nucleus disintegration is considered. It is shown that were the spin of the Λ particle greater than 3/2, the lifetime of the Λ nuclei would be considerably less than observed. (auth)

7424
THE BASIS OF NUCLEAR PHYSICS. Enrico Persico. pp. 23-42 in "Proceeding of the Scientific Congress, Nu-

clear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

A brief review is given of the fundamentals of nuclear physics, with brief discussion of the atom and nucleus, radioactivity, particle acceleration and nuclear reactions, the neutron and fission, and fissionable and fertile materials. (J.S.R.)

Nuclear Properties

7425 WASH-745

Nuclear Cross Sections Advisory Group, AEC. REPORTS TO THE AEC NUCLEAR CROSS SECTIONS ADVISORY GROUP, COLUMBIA UNIVERSITY, NEW YORK, NOVEMBER 25-26, 1957. V. L. Sailor. 40p. $1.25(OTS).

The status of nuclear cross section research programs at ANL, BNL, Columbia Univ., Duke Univ., KAPL, HAPO, LASL, ORNL, IDO, Rice Inst., and UCRL is briefly summarized. Preliminary data and recent developments in instrumentation and techniques are included. (For preceding report see WASH-174.) (D.E.B.)

7426

PROPERTIES OF NUCLEAR MATTER. L. C. Gomes, J. D. Walecka, and V. F. Weisskopf (Massachusetts Inst. of Tech., Cambridge). Annals of Physics 3, 241-74(1958) Mar.

An account is given of recent theories by Brueckner, Eden, Swiatecki, Bethe, and co-workers about the properties of nuclear matter, which is identical in content, but different in its method of presentation. This presentation tries to clarify the reasons for the applicability of the independent-particle model and to determine what particular features of the nuclear forces are responsible for the validity of this model. (auth)

7427

INVESTIGATION OF INTERNAL STRUCTURE OF THE NUCLEUS WITH THE AID OF MESONS AND ELECTRONS. A. O. Wajsenberg. Chem. Szkole 1, No. 5, 4-14(1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3176).

7428

STUDY OF THE EXCITED LEVELS OF B^{10}. Jeannine Génin. Compt. rend. 246, 1028-31(1958) Feb. 17. (In French)

The reaction $Be^9(d,n)B^{10}$ was studied with deuterons with an average energy E_d = 0.695 and 0.570 Mev. The first five levels of B^{10} have excitation energies of 0.72, 1.72, 2.16, 2.95, and 3.60 Mev. The level at 2.95 Mev confirms a previous study by Reid. The probable existence of a level at 1.20 Mev is shown. (tr-auth)

7429

DYNAMIC POLARIZATION OF THE NUCLEI OF SILICON 29 IN SILICON. Anatole Abragam, Jean Combrisson, and Ionel Solomon. Compt. rend. 246, 1035-7(1958) Feb. 17. (In French)

The extension of the Overhauser effect to semi-conductors has resulted in considerable augmentation of the nuclear resonance signal caused by Si^{29} in saturating the resonance of the conducting electrons of a sample of silicon. The nuclear polarization thus obtained lasts for several minutes at ordinary temperature. (tr-auth)

7430

A CONTRIBUTION TO THE THEORY OF NEUTRON REACTIONS. Zlatko Jankovic (Inst. "Ruder Boskovic", Zagreb). Glasnik Mat. Fiz. i Astron. 10, No. 1-2 47-64 (1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3232).

The cross section of scattering of neutrons by nuclei is calculated with the aid of an optical model in which the potential has a diffuse boundary. It is proposed that the potential diminishes linearly in the diffuse-boundary region. The dependence of the results on the choice of the depth of the potential well, on the width of the diffuse boundary, and on the size of the imaginary part of the potential was investigated. (auth)

7431

NUCLEAR LEVELS AND SHELL MODEL. Ch. Terreaux (Seminar für theoretische Physik der Universität Zürich). Helv. Phys. Acta 31, No. 1, 45-68(1958). (In German)

This is a continuation of a previous paper (Helv. Phys. Acta 30, 183(1957)), concerning a systematic comparison of the experimental low levels of odd nuclei with the one-particle levels predicted by the shell model. The principles of the graphic representation used in these papers are briefly summarized. All the low empirical levels for the region N = 13 to 81 with Z = even, N = odd are graphically represented. The behavior of these levels can generally be understood within the framework of the generalized spherical shell model (with configuration mixtures included). A new discussion of the Bethe-Weizsäcker formula for the binding energy is given. The various contributions to the binding energy are interpreted in terms of the typical parameters of the shell model, like depth and radius of the potential well, etc. The constant of the principal term of this formula proportional to A is determined theoretically from the nuclear radius only. The agreement with the empirical value of this constant is excellent. Finally, the nuclear radii are discussed in the light of the shell model. (auth)

7432

STUDY OF THE STRUCTURE OF C^{12} USING THE TOTAL DISINTEGRATION $C^{12}(p, p')3\alpha$. A. Samman and P. Cüer (Laboratorie de Physique Corpusculaire, Strasbourg). J. phys. radium 19, 13-15(1958) Jan. (In French)

The existence of primary collisions ($p-\alpha$, p') in the C^{12} nucleus is clearly demonstrated by a detailed study of about one hundred well-measurable events. The geometrical configurations of collision products gives the initial energy of the knocked-on α particle in the nucleus and the average spectrum of this energy. The remaining Be^8 nuclei have excitation energies that can be then computed and seem reasonable. (tr-auth)

7433

STUDY OF THE EXCITATION AND AUTO-IONIZATION OF THE ELECTRON CORTEGE ACCOMPANYING THE K CAPTURE OF Ge^{71}. Michel Langevin (Collège de France, Orsay). J. phys. radium 19, 34-5(1958) Jan. (In French)

Proportional counter study of the probability for the production of a double vacancy in the K shell during K capture of Ge^{71} gives the value $P(2) = (1.33 \pm 0.15)\ 10^{-4}$, the partial probability of auto-ionization being $P(\text{eject.}) = (0.78 \pm 0.07)\ 10^{-4}$. These experimental results are in good agreement with the theory of Primakoff and Porter. (tr-auth)

7434

THE BETA AND ELECTRON SPECTRUM OF RaD. J. Tousset and A. Moussa (Institut de Physique Nucléaire, Lyon). J. phys. radium 19, 39-40(1958) Jan. (In French)

The electron spectrum of RaD (Pb^{210}) above 3 kev was studied. The two nuclear beta spectra of 15 and 61 kev have been separated from the Auger L electrons. The fluorescence and Auger yields of the L shell have been measured. (tr-auth)

7435
STUDY OF THE EXCITED LEVELS OF $^{84}Po^{214}$ (RaC). G. R. Bishop and F. Madaule. J. phys. radium 19, 41-3 (1958) Jan. (In French)

Coincidence measurements on the γ rays and β rays of Po^{214} lead to a decay scheme. Spins and parities of the excited states are proposed on the basis of angular correlation studies, internal conversion coefficients, and β-ray lifetime determinations. There is evidence of collective model effects for this nucleus. (tr-auth)

7436
REACTIONS (p,γ) OF MAGNESIUM 25 AND 26. Robert Barjon, Michel Lambert, and Jean Schmouker (École Polytechnique, Paris). J. phys. radium 19, 47-8(1958) Jan. (In French)

This paper describes the present performance of the 2 Mev Van de Graaff of the "Ecole Polytechnique" and gives the data of the excitation curves of magnesium 25 and 26 by protons in the 1 to 2 Mev energy range. (tr-auth)

7437
NEW EXPERIMENTAL DATA (OBTAINED BY RADIOACTIVITY AND NUCLEAR REACTIONS) ON ISOTOPES OF MOLYBDENUM. ATTEMPT AT INTERPRETATION OF CERTAIN EXCITED LEVELS. C. Levi and L. Papineau (C. E. N., Saclay, France). J. phys. radium 19, 51-3(1958) Jan. (In French)

New data from radioactivity and nuclear reactions on molybdenum isotopes indicate that the level distance $d^5/_2$ to $g^7/_2$ is greater than 1 Mev and that the shell model alone cannot explain the lower levels. (tr-auth)

7438
THE EXCITED LEVELS OF EVEN-EVEN NUCLEI OF THE INTERMEDIATE REGION. M. Jean and J. Touchard (Institut de Physique Nucléaire, Orsay). J. phys. radium 19, 56-9(1958) Jan. (In French)

The properties of the first excited levels of even-even nuclei belonging to intermediate area, between closed shell nuclei and the spheroidal nuclei zone, are discussed in terms of quadrupole vibrations in the vicinity of a spherical equilibrium shape. (tr-auth)

7439
COLLECTIVE LEVELS IN EVEN-EVEN NUCLEI BETWEEN MASSES 182 AND 206. R. Barloutaud, A. Lévêque, P. Lehmann, and J. Quidort (C. E. N., Saclay, France). J. phys. radium 19, 60-3(1958) Jan. (In French)

Reduced transition probabilities of the 2+ levels in W^{186}, Os^{188}, Os^{190}, Os^{192}, Pt^{194} are deduced from Coulomb excitation experiments. 2+ levels systematics of even-even nuclei in this region are compared with the theory of vibrational levels. (tr-auth)

7440
ANGULAR CORRELATION OF TWO MIXED GAMMAS OBTAINED BY COULOMB EXCITATION. Vincent P. Gillet (C. E. N., Saclay, France). J. phys. radium 19, 64-5(1958) Jan. (In French)

Exact computation is made of the correlation of two mixed gamma rays following Coulomb excitation in order to determine some general characteristics of triple correlation processes. The nucleus chosen is Ta^{181} and the dependence of the maximum anisotropy as a function of the reduced matrix elements of the second emitted gamma is given. (tr-auth)

7441
ON THE METHOD OF DELAYED COINCIDENCES. AVERAGE LIFE OF THE FIRST EXCITED LEVEL OF B^{10} S. Gorodetzky and A. Knipper (Institut de Recherches nucléaires, Strasbourg). J. phys. radium 19, 83-5(1958) Jan. (In French)

The comparison method in delayed coincidence experiments is discussed, and the fast coincidence circuit is described. The half-life $T_{1/2} = (8 \pm 2) \cdot 10^{-10}$ sec has been determined for the first excited state of B^{10}. (tr-auth)

7442
SOME PROPERTIES OF ABNORMALLY LONG PARTICLES EMITTED BY RADIOELEMENTS. Marie Ader and Marie-Paule Cabannes (Collège de France). J. phys. radium 19, 106-7(1958) Jan. (In French)

Natural polonium sources and artificial polonium sources from bismuth irradiated by neutrons emit radiation, abnormally long and with the same characteristics. This radiation does not seem due to the presence of radioactive impurities in the sources. Emission of neutrons by the two sources is also observed. (tr-auth)

7443
EXCITED STATES OF ^{40}Ca. Yasuo Hirao, Eiji Okada, Iwao Miura, and Tetsuo Wakatsuki (Osaka Univ.). J. Phys. Soc. Japan 13, 233-7(1958) Mar.

By bombarding a natural calcium target with 5.7-Mev protons, gamma rays of energy 3.7 and 3.9 Mev were observed with a NaI(Tl) three-crystal pair spectrometer. The intensity of 3.7-Mev gamma ray is about 25% of 3.9-Mev gamma ray. Angular distribution of these gamma rays was measured with a single-crystal scintillation spectrometer. The result can be expressed as follows: $1 + 1.90\cos^2\theta - 1.03\cos^4\theta$. From comparison with theory it is highly probable that 3.90 Mev state has spin 2. (auth)

7444
MAGNETIC MOMENT OF THE FIRST EXCITED STATE OF $_{62}Sm^{152}$. Kenzo Sugimoto (Osaka Univ.). J. Phys. Soc. Japan 13, 240-3(1958) Mar.

The first excited state (122-kev) of the even-even nucleus Sm^{152} was excited by the Coulomb excitation with 2-Mev protons. The angular distribution of the de-excitation radiation was investigated. The attenuation factor of the angular distribution $G_2 \sim 0.6$ was obtained using a samarium oxide target. The rotational change of the pattern in the angular distribution was examined under the condition of applying an external magnetic field vertical to the incident protons. The apparent g-factor for this state obtained was $g(Sm^{152}, 2^+) = +(0.36 \pm 0.16)$ n.m. A brief discussion about the effect of nuclear surroundings affecting the present determination was given. (auth)

7445
SPECTROSCOPIC DETERMINATION OF NUCLEAR MOMENTS OF Cu^{63} AND Cu^{65}. N. I. Kalitiyevskiy and M. P. Chayka. Optika i Spektroskopiya No. 5, 606-11(1956). (Translated from Referat Zhur. Khim. No. 4, 1957, abstract No. 10823)

By means of a Fabry-Perot interferometer an investigation was made of hyperfine structure of lines 5700 and 5782 A in spectra of separated isotopes of copper (Cu^{63} and Cu^{65}). Structure of $3d^94s^2\ ^2D$ term was studied. From hyperfine splitting of this term were calculated the values of constants of magnetic (A) and quadrupole (B) interaction: $A(Cu^{63}) = 64.4 \times 10^{-3}$, $A(Cu^{65}) = 65.7 \times 10^{-3}$; $B(Cu^{63}) = 0.30 \times 10^{-3}$, $B(Cu^{65}) = 0.23 \times 10^{-3}$ cm^{-1}. The magnitude of the quadrupole moment Q of nucleus was calculated. It was found that $Q(Cu^{63}) = -0.28 \times 10^{-24}$ cm^2 and $Q(Cu^{65}) = 0.22 \times 10^{-24}$ cm^2. (W.L.H.)

7446
A NEW ISOTOPE OF IRON Fe^{61}. E. Ricci, J. Pahissa Campá, and N. Nussis. Publs. com. nacl. energía atómica (Buenos Aires) Ser. quim. 1, No. 11, 129-40(1957).

A half life of 6.0 ± 0.5 minutes was found in the iron fraction obtained by (n, α), (n, αp), and (d, αp) reactions on Ni, Cu, and Ni, respectively. Mass number 61 was assigned to the new iron isotope because it decays to 99

minutes Co^{61}, already known. This latter isotope was separated from its mother substance at intervals. Fe^{61} emits β^- and γ rays. The maximum energy of the negatrons emitted was determined by the absorption method to be 2.8 Mev. The total disintegration energy is about 3.9 Mev, which value was obtained from the absorption curve that was taken by a calibrated tube. A gamma ray of 0.29 ± 0.03 Mev was also identified and confirmed to be emitted by the new nuclide. (auth)

7447
THE TOTAL CROSS SECTIONS FOR THE INTERACTION OF NEUTRONS WITH Li^6 AND Li^7 FROM 10 TO 450 kev. G. V. Gorlov, B. M. Gokhberg, V. M. Morozov, and G. A. Otroshchenko. Soviet Phys. (Doklady) 1, 598-9(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3584.

7448
TOTAL CROSS SECTIONS FOR THE INTERACTIONS OF 650 Mev PROTONS AND NUCLEI. V. I. Moskalev and B. V. Gavrilovskii (Inst. for Nuclear Problems, Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 607-9(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3528.

7449
THE UPPER LIMIT OF THE RADIATION CAPTURE CROSS SECTION OF 275 kev RESONANCE NEUTRONS BY Li^7. E. A. Koltypin and V. M. Morozov. Soviet Phys. (Doklady) 1, 655-7(1956) Nov.-Dec.

The (n,γ) cross section in Li^7 for thermal neutrons was determined by comparison with the $Li^6(n,t)He^4$ reaction. The cross section was measured as 42 ± 10 millibarns, in satisfactory agreement with previous measurements. Measurements with thermal neutrons of the resonance energy (275 kev) gave an estimated upper limit of the radiation capture cross section of resonance neutrons of ¼ millibarns. The counter used in the measurements is of unusual construction and is illustrated. (J.S.R.)

7450
MEASUREMENTS OF THE $Li^6(n,t)He^4$ CROSS SECTION FOR NEUTRONS WITH ENERGIES FROM 9 TO 700 kev. G. V. Gorlov, B. M. Gokhberg, V. M. Morozov, and G. A. Otroschenko. Soviet Phys. (Doklady) 1, 705-7(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4119.

7451
INTERACTIONS OF FAST PIONS AND NUCLEI. L. P. Kudrin and B. A. Nikol'skii. Soviet Phys. (Doklady) 1, 708-11(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4036.

7452
ON POSITRON ANNIHILATION IN METALS. V. I. Karpman and I. Z. Fisher (Minsk Pedagogical Inst. and V. I. Lenin Byelorussian State Univ.). Soviet Phys. (Doklady) 1, 765-8(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 5936.

Nuclear Reactors

Refer also to abstract 7231.

7453 AECU-3646
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]
[PWR] COOLANT CHEMICAL ADDITION SYSTEM; SYSTEM DESCRIPTION NO. 7. Nov. 20, 1957. 35p. $6.30 (ph OTS); $3.00 (mf OTS).

For inclusion in Vol. II of the Shippingport Atomic Power Station Manual.

The coolant chemical addition system provides facilities for adding to the reactor coolant system (a) oxygen scavengers and corrosion inhibitors, (b) lithium hydroxide solution, and (c) a neutron poison or neutron absorbing substance. (A.C.)

7454 AECU-3648
Detroit Edison Co., Detroit.
THERMAL CYCLE TEST OF AN APDA FUEL PIN. Engineering Lab. and Research Dept. Report 56E30. J. J. Bodzin, F. T. Rath, and C. A. Anderson. Jan. 31, 1957. 32p. Contract [AT(11-1)-476]. $6.30 (ph OTS); $3.00 (mf OTS).

An investigation to determine the effect of thermal cycling in sodium of a fuel pin is reported. The pin submitted for the test was composed of uranium–2 wt. % zirconium sheathed in zirconium. The test consisted of the following thermal cycle: heating to 1250°F, holding 5 min, then cooling to 250°F and holding at 250°F to prevent the freezing of the sodium. The duration of the test was 25 cycles. At the completion of the thermal cycling, the pin was examined visually to determine whether any physical damage was evident, and what dimensional and metallurgical changes had occurred. (auth)

7455 AECU-3650
Detroit Edison Co., Detroit.
THERMAL CYCLE TEST IN SODIUM OF AN APDA FUEL PIN. Engineering Lab. and Research Dept. Report 57CC6-1. J. J. Bodzin and T. A. Alessi. June 13, 1957. 25p. Contract [AT(11-1)-476]. $4.80 (ph OTS); $2.70 (mf OTS).

An investigation was undertaken to determine the effect of thermal cycling in sodium of various fuel pins. The pin submitted for this test was a depleted uranium–10 wt. % molybdenum fuel pin sheathed with sponge zirconium, commercial grade. The pin was not end capped. The test consisted of the following thermal cycle: heating to 1375 ± 25°F, holding, cooling to 250 ± 25°F. The temperature of the test specimen exceeded 1200°F for at least 30 min. for each cycle. At the conclusion of 25 cycles, the pin was examined visually to determine whether any physical damage was evident, and what dimensional and metallurgical changes had occurred. (auth)

7456 AECU-3658
Allis-Chalmers Mfg. Co., Milwaukee.
FUEL ELEMENT SUBASSEMBLY NOZZLE TEST IN HOT SODIUM FOR ATOMIC POWER DEVELOPMENT ASSOCIATES. [1957]. 17p., 2 illus. (ACNP-5728). $4.80 (ph OTS); $2.70 (mf OTS).

A test to determine the effect of rubbing contact on various surfaces of a fuel element nozzle when submerged in 750°F Na is described. (M.H.R.)

7457 AECU-3661
Los Alamos Scientific Lab., N. Mex.
FISSION FRAGMENT IONIZATION AND ELECTRICAL POWER PRODUCTION. R. W. Bussard. Feb. 5, 1957. 4p. Contract [W-7405-eng-36]. $1.80 (ph OTS); $1.80 (mf OTS).

A reactor concept is discussed consisting of parallel plates, spaced with a gap equal to plate thickness with a 2.0 v potential available across the gap. Fissions are assumed to take place in a mixture of U and Ar gas between the plates. The operating scheme is as follows: U fissions in the gas; the fission fragment energy is almost all absorbed by ionization of the gas, leading to a high ion

pair density in the gas; positive and negative particles are swept out of the gas by the 2.0 v field, resulting in a current flow through an external circuit connecting the plates. It is concluded that this method of converting fission energy "directly" to electrical energy appears impractical. (M.H.R.)

7458 ANL-5843
Argonne National Lab., Lemont, Ill.
TEMPERATURE COEFFICIENT MEASUREMENTS ON A CRITICAL MOCK-UP OF EBR-I. John K. Long. Mar. 1958. 28p. Contract W-31-109-eng-38. $1.00(OTS).

A rough mock-up of the EBR-I reactor was built in the ZPR-III critical assembly machine, with resistance heaters in the core and inner blanket. The variation of reactivity with core temperature was observed. Lateral expansion was measured as the core was heated. A temperature coefficient of −0.42 inhour per degree Centigrade was observed when the core alone was heated, and −0.72 inhour per degree Centigrade was observed when the core and inner blanket both were heated. Essentially all of these coefficients are attributable to volume expansion. (auth)

7459 APAE-18(Suppl. 1)
Alco Products, Inc., Schenectady, N. Y.
INITIAL OPERATION AND TESTING OF THE ARMY PACKAGE POWER REACTOR; CONSTRUCTION AND OPERATIONAL PROBLEMS AND DELAYS. Mar. 20, 1958. 19p. Contract AT(11-1)-318. $3.30(ph OTS); $2.40(mf OTS).

7460 APDA-120
Michigan. Univ., Ann Arbor. Engineering Research Inst.
REPORT ON THE POSSIBLE EFFECTS ON THE SURROUNDING POPULATION OF AN ASSUMED RELEASE OF FISSION PRODUCTS INTO THE ATMOSPHERE FROM 300 MEGAWATT NUCLEAR REACTOR LOCATED AT LAGOONA BEACH, MICHIGAN. Henry J. Gomberg, Thomas Bassett, and Carlos Velez. Foreword by Alton P. Donnell. July 1957. 109p. Project 2506. For Atomic Power Development Associates, Inc. $16.80(ph OTS); $5.70(mf OTS).

7461 APDA-123
Atomic Power Development Associates, Inc., Detroit.
RESEARCH AND DEVELOPMENT ACTIVITIES QUARTERLY REPORT [FOR] APRIL–JUNE 1957. 17p. $3.30 (ph OTS); $2.40(mf OTS).

A general review of Fermi Fast Breeder Reactor research and development is presented. Attention is directed primarily to the development of less expensive shielding material and more satisfactory fuel materials and fuel pin fabrication methods. (D.E.B.)

7462 BMI-X-135(Del.)
Battelle Memorial Inst., Columbus, Ohio.
STATUS OF AN ALTERNATE CONTROL MATERIALS PROGRAM. R. W. Dayton. Jan. 15, 1957. Decl. with deletions Mar. 7, 1957. 7p. $1.80(ph OTS); $1.80(mf OTS).

A study being made of the tensile properties and corrosion resistance of several boron and B_4C dispersions in titanium is summarized. A study of dispersions of ZrB_2 in titanium to determine the optimum loading and particle size of the ZrB_2 necessary to obtain the best corrosion resistance, mechanical properties, and core-to-clad bond is currently in progress. Development work on fabrication of full-size control-rod blades is reported. Cladding of boron–titanium dispersions with Zircaloy-2 is discussed as possible alternate control rod material. (A.C.)

7463 CF-53-3-213
Oak Ridge National Lab., Tenn.
PACKAGE POWER REACTOR NO. 1 STEAM CYCLE CALCULATIONS. W. R. Gall and J. D. Maloney. Mar. 30, 1953. Decl. Nov. 18, 1954. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A study was made to determine the best steam cycle arrangement and reactor power requirement for a package power reactor system to supply a remote army station requiring 1000 kw of electricity and 250 boiler horsepower (7.55×10^6 Btu/hr) of steam heating load. It was assumed that gross electric power requirement would be 1300 kw of electricity. (auth)

7464 CF-57-8-4
Oak Ridge School of Reactor Technology, Tenn.
FEASIBILITY STUDY OF A HOMOGENEOUS FUSED SALT-MOLTEN METAL COOLED-POWER REACTOR SYSTEM. Reactor Design and Feasibility Study. W. A. Box, C. S. Barnett, R. Bean, S. J. Ditto, F. A. Hasenkamp, L. R. Pollack, and M. L. Winton. Aug. 1957. 200p. $3.00(OTS).

The reactor system consists of a homogeneous fused salt reactor coupled to a steam power plant by a molten Pb heat transfer system. The primary heat exchange between the fused salt fuel and the Pb is done by direct mixing of the salt and Pb in a jet pump. There are no mechanical pumps or wall type heat exchangers in the fused salt fuel system. The salt and Pb are separated downstream from the jet pump by a pipeline separator. The thermal energy is then transferred to the steam system by the molten Pb through conventional type heat exchangers. (auth)

7465 CF-57-8-14
Oak Ridge School of Reactor Technology, Tenn.
FLUIDIZED BED REACTOR STUDY. Reactor Design and Feasibility Study. C. L. Teeter, T. Ciarlariello, B. L. Hoffman, D. H. Jorgensen, F. D. Judge, L. J. King, D. A. McCune, N. R. Scheve, and H. E. Zellnik. Aug. 1957. 203p. $31.80(ph OTS); $9.30(mf OTS).

A feasibility study of a fluidized bed reactor system was undertaken. Initial studies were conducted on a fast, sodium cooled system, a gas cooled system, and organic and water moderated thermal systems. The organic moderated and light water moderated systems showed promise. The light water system was chosen for a detailed study to enable comparison with existing pressurized water reactors. The detailed study resulted in the selection of a slightly enriched uranium reactor with a heat production capability of 465 Mw. If the plutonium produced is recycled, natural or depleted material can be utilized as feed. The economic study indicated fuel costs between 1.8 and 2.7 mills/kw-hr assuming a plant load factor of 0.85. (auth)

7466 CF-57-11-30
Oak Ridge National Lab., Tenn.
POWER CALIBRATION FOR BSR LOADING 33. E. B. Johnson. Nov. 28, 1957. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

BSR Loading 33 consists of an essentially 5 by 6 fuel element array completely reflected by water. It was controlled by means of two boron carbide shim-safety rods and a type 347 stainless steel regulating rod with an 87-mil wall, located as shown in Fig. 1. The critical mass was about 3.4 kg of U^{235}, with an excess reactivity for the clean cold loading of about 0.6%. The total mass in the initial loading was 3.6 kg of U^{235}. Loading 33 was initially assembled in November 1954, from clean cold fuel elements. The power calibration was made during the first series of runs at power levels appreciably above 1 watt. Cobalt foils were used as the detector material for the thermal neutron flux determination in the lattice. The foils were exposed at 6-in. intervals in vertical traverses in the water

passage between the last two plates on the outside of the fuel elements. Measurements were also made along the vertical axis of the element in lattice position 25, which was approximately at the center of the configuration. Cadmium ratios were determined at centerline and at 6-in. intervals below centerline. Symmetrical flux distribution was assumed around the north-south centerline of the core and cadmium ratios were assumed to be symmetrical around the reactor horizontal centerline. The treatment of the data has been described in detail in ORNL-1027 and ORNL-1682. (auth)

7467 CRRP-724

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

CALCULATED TEMPERATURE COEFFICIENT FOR SEVERAL LOADINGS OF THE POOL TEST REACTOR. G. L. Keech and R. M. Pearce. Feb. 14, 1958. 32p. (AECL-562). $1.00(AECL).

The temperature coefficients of reactivity have been calculated for PTR with internal thermal columns of various sizes consisting of light water and of graphite. The contributions from the changes in the nuclear constants in the core, reflector and the internal thermal column, and the change in geometry are given separately. The prompt coefficients which are of interest in safety considerations are all predicted to be negative. The overall temperature coefficients for the various loadings at 20°C are in the range $+0.68 \times 10^{-4}$ to -2.18×10^{-4} per °C. (auth)

7468 ES-19

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

N.R.X. CALANDRIA TUBE REPLACEMENT PROCEDURE. S. J. Whittaker. [1955?]. 45p.

The method used to replace a ruptured calandria tube in the NRX Reactor is described. This was accomplished without the removal of any of the normally fixed shielding. (W.L.H.)

7469 IDO-16221

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

REACTOR CALCULATIONS ON THE CARD-PROGRAMMED CALCULATOR. D. D. Dix. Apr. 19, 1955. 54p. Contract AT(10-1)-205. $0.40(OTS).

A description is given of the difficulties which occur in developing a machine program for solution of the problems of reactivity and criticality calculations. The methods which have been applied to overcome these difficulties in the case of two-group calculations for a reflected cylinder are discussed. The calculation of the Bessel functions, the major difficulty, is described. (J.S.R.)

7470 KAPL-1868

Knolls Atomic Power Lab., Schenectady, N. Y.

QUARTERLY REACTOR TECHNOLOGY REPORT NO. 3 [FOR] JULY, AUGUST, SEPTEMBER 1957. 76p. Contract W-31-109-Eng-52. $2.00(OTS).

Burnup rate studies were made for dysprosium isotopes as a step in their evaluation as burnable poisons. The variational method was applied to the calculation of flux ratios in repeating slab arrays. Calculated values were compared with measurements made in the Flexible Plastic Reactor. A one-dimensional three-group code was modified to calculate the thermal fluxes obtained from three types of source distribution in a cylindrical reactor having an effective multiplication factor of 0.753. Resonance capture and Doppler effect curves were plotted for slab arrays of U^{238} and H_2O. A general study of the use of medium-enriched fuel to reduce reactivity changes with life was carried out. The study included buildup and burnout of the U^{238} chain through Pu^{241}. The mean slowing-down time was plotted for a pulse of fast neutrons in a subcritical multiplying H_2O-moderated medium. A number of one-group calculations were completed which show fractional changes in reactivity as a function of depth of insertion of a black central control rod. Other computer studies reported include criticality studies of a rectifier reactor, the effect of europium on the temperature defect of a water moderated thermal reactor, variational studies of resonance escape probability in lattices, and studies of cold water accidents with the SPY code. Further tests were conducted to determine the feasibility of continuous sampling of unit cell effluent for fuel element failure detection. Results are reported from radiation effects studies of Gd_2O_3-stainless steel and Eu_2O_3-stainless steel control materials. Studies of hydrogen diffusion and distribution in tin–zirconium and uranium–zirconium alloys were continued. A new method for measuring gases in reactor primary cooling water is described. (For preceding period see KAPL-1803.) (D.E.B.)

7471 KAPL-M-JBS-10

Knolls Atomic Power Lab., Schenectady, N. Y.

REACTIVITY PERTURBATION OF SMALL TEST REGIONS IN A CRITICAL ASSEMBLY. John B. Sampson. Oct. 15, 1957. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The economy achieved by carrying out measurements on a lattice or arrangement of an assembly in a limited region of another critical assembly has led to various applications. Such an arrangement can produce quantitative data with greater speed and flexibility than is possible if an entire critical assembly or exponential experiment has to be constructed of the arrangement to be tested. Various lattice parameters and the k_∞ of the test lattice as determined by criticality measurements are commonly studied. Some corrections are necessary in correctly interpreting these experiments. Due to the difference in neutron properties between the outside region of the critical assembly, referred to as "driver," and of the neutron properties of the interior "test" region the neutron distribution at the edge of the test region is different than that which would apply if the test region were surrounded by an environment of its own lattice. A reactivity correction results, that is, the reactivity of the test lattice in its own environment differs somewhat from that indicated by the critical assembly in which it is tested. (auth)

7472 KAPL-M-JKP-1

Knolls Atomic Power Lab., Schenectady, N. Y.

HEAD LOSS AND OPERATIONAL TESTS ON 12" MAIN COOLANT CHECK VALVE. J. K. Powledge. Feb. 18, 1958. 115p. Contract W-31-109-Eng-52. $21.30(ph OTS); $6.90(mf OTS).

The double-pivoted design of the main coolant check valve for the Submarine Advanced Reactor (SAR) power plant represents a new approach to obtain check valves with low pressure drop characteristics at all flow rates. Hydraulic tests were conducted on a full-scale plastic model of the 12 in. SAR check valve at ambient temperature, and at flow rates from 0 to about 8500 gpm, to confirm the design suitability and performance. Primarily, tests were conducted with the valve model installed in a 12 in. test loop to determine head loss, flow patterns, and operating characteristics at various attitudes of list and trim with flow in the forward and reverse directions through the valve, and with the valve disc free for normal operation. It was found that this design combines the advantages of both the swing check and tilting disc check valve, giving relatively low head losses over the entire range of flows; at

full flow conditions, the head loss coefficient, k, is approximately 0.1. Flow patterns through the valve were good and indicated no dead spots or appreciable restriction of flow in the SAR operating range. The results of the test indicate that this check valve design meets all of the specified shipboard operating requirements. (auth)

7473 KAPL-M-JTD-1
Knolls Atomic Power Lab., Schenectady, N. Y.
COMPARISON OF REACTIVITY CHANGES IN $Fe-H_2O$ AND $Zr-H_2O$ CORES. J. T. Daley, Jr. Aug. 28, 1957. 28p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70 (mf OTS).

Three-group hand calculations have been done to compare the amount of distributed B^{10} to control a practical $Fe-H_2O$ reactor against a $Zr-H_2O$ reactor of equivalent geometry. These have been done for a 4000 hour homogeneous system for hot and cold operating conditions, at various Xe concentrations, at start and end of life. The amount of B^{10} is found to be nearly the same, and it is concluded that (for the control of the reactivity difference between cold, clean and hot, peak Xe conditions), the Fe and Zr systems require about the same number of rods. Comparisons of k_{eff} between $Fe-H_2O$ and $Zr-H_2O$ systems, for the above mentioned conditions, have been made for a variety of core sizes. (auth)

7474 NACA-RM-SE58A22
Lewis Flight Propulsion Lab., Cleveland.
FINAL HAZARDS SUMMARY FOR THE NACA ZERO POWER REACTOR FACILITY. D. J. Connolley, ed. Jan. 27, 1958. 33p.

The organization and administration within the division of the Lewis Flight Propulsion Laboratory which is concerned with the reactor facility are included. Operating procedures, fuel handling procedures, experimental procedures, and health physics procedures are discussed. Design changes made since the initial hazards summary was submitted are given. (M.H.R.)

7475 NDA-27-16
Nuclear Development Corp. of America, White Plains, N. Y.
SUMMARY OF APDA FAST REACTOR SAFETY STUDIES. W. H. Jens. Oct. 1956. 34p. $0.30(OTS).

In the evaluation of the safety of a reactor system it is usual to hypothesize many series of events which would lead to serious accidents. These events are then analyzed to determine quantitative results. The assumptions, important considerations, techniques, and results of a number of such studies which were made for the APDA fast breeder reactor are described. In general the initial assumption is made that reactivity is inserted at a linear rate into a reactor that has a neutron source and a negative temperature coefficient. (auth)

7476 ORNL-2072
Oak Ridge National Lab., Tenn.
DYNAMICS OF THE HOMOGENEOUS REACTOR TEST. Paul R. Kasten. June 7, 1956. Decl. Mar. 4, 1957. 152p. Contract W-7405-eng-26. $0.80(OTS).

The safety and stability of the Homogeneous Reactor Test (HRT) have been investigated for a variety of operating conditions and blanket materials. Indications are that the outer pressure vessel will not fail even under the most adverse conditions anticipated and that normal operating procedures and safety restrictions are sufficient to protect the core tank against reactivity changes, load demand changes, and "walkaway" appears assured in the present design. The HRT is to be fueled with an aqueous, highly enriched UO_2SO_4 solution, and may have D_2O, a ThO_2-D_2O slurry, or a natural uranium $UO_2SO_4-D_2O$ solution as the blanket material at different times. The safety of the reactor is dependent upon the core temperature coefficient of reactivity, which has a value of about $-2 \times 10^{-3}\Delta k_{\rho}C$. The different blanket materials influence the value for the prompt neutron lifetime, but have little effect on the core temperature coefficient. The maximum allowable rates of reactivity addition as well as maximum allowable instantaneous reactivity additions, based upon the limiting pressure rise within the system, are given for reactor conditions of 2000 psi, 280°C, and a source power level of 10^7 neutrons/sec. (auth)

7477 SL-1459
Sargent and Lundy, Chicago.
TEST TO DETERMINE CERTAIN DESIGN CHARACTERISTICS OF NUCLEAR POWER PLANT CONTAINMENT VESSELS. Feb. 5, 1957. 71p.

The design of containment vessels for a nuclear power reactor may necessitate consideration of the transient thermal stresses and pressure stresses which may occur in the vessel wall. The most serious of these stresses would be due to the rapid increase in temperature of the inside volume following the release of a large quantity of hot water or steam from a system rupture. The analytical determination of this stress requires that a value be assigned to the film coefficient of heat transfer. In order to evaluate this film coefficient a testing program was inaugurated. This report presents the data obtained from these tests. (A.C.)

7478 WAPD-MRP-52(Rev.)
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
PRESSURIZED WATER REACTOR PROGRAM TECHNICAL PROGRESS REPORT FOR THE PERIOD FEBRUARY 10, 1955 TO MARCH 24, 1955. Changed from OFFICIAL USE ONLY Jan. 2, 1958. 142p. Contract AT-11-1-GEN-14. $2.75(OTS).

Current PWR plant parameters are reviewed. Process specifications for the melting of U–Mo and U–Nb alloys are presented. The preparation of sintered UO_2 pellets containing polyvinyl alcohol as a binder was achieved without loss of corrosion resistance characteristic of such pellets. Volumetric O/U ratios were investigated in the high- and low-pressure oxidation of U by steam to UO_2. The corrosion of compacted UO_2 was then studied in water at 650°C. Further results are reported on studies of the chemical reaction between Zr and UO_2. Previously reported investigations on the water corrosion of U–Mo, U–Mo–Nb, U–Mo–Pt, and U–Nb were extended. The corrosion of Zircaloy cladding for these alloys was also tested. The effect of melting, drawing, extruding, annealing, and fabrication conditions on corrosion was also considered. No cracking or serious pitting was observed on a group of stainless steels exposed to citric acid solution for 1 hr at 180°F. The effects of radiation on the corrosion life of clad and unclad U–Mo and bare U–Si alloys were investigated. Radiation effects on Zircaloy-clad UO_2 dimensional stability, state of aggregation, and fission gas release were examined. It has been determined that a 52% power fraction for the U–Mo blanket will exist for a 3/1 H_2O-to-U volume ratio. Operation of the seeded core for 3000 hr operation calls for a tentative loading of 69 kg of U^{235}. For an oxide blanket with the same H_2O-to-U ratio, the blanket power fraction is 60% and a loading of 52 kg of U^{235} is indicated. (D.E.B.)

7479 WAPD-MRP-55(Rev.)
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
PRESSURIZED WATER REACTOR PROGRAM TECHNICAL PROGRESS REPORT FOR THE PERIOD JUNE 17, 1955 TO JULY 28, 1955. Changed from OFFICIAL USE ONLY Mar.

6, 1957. 97p. Contract AT-11-1-GEN-14. $2.25(OTS).

A contract was awarded for the fabrication of the PWR pressurizing tank. The vessel is designed for 2500 psia, with dimensions of about 18 ft × 66 in. Tests were conducted on the feasibility of using a magnetic brake for holding a control rod in position when power to the motor is shut off. Fuel rod dimensions and tolerances are given. A longitudinal section drawing through the reactor is presented. Recent UNIVAC results indicate the effect of cladding clearances on the reference blanket fuel rod will require further design modifications. A system for detecting fuel element failure by gamma radiation instrumentation is being tested. Further tests were made on fuel rod fabrication techniques, including the welding of end closures and in-pile radiation testing. Some additional data are reported on the crystal structure of U–5 wt. % Mo alloy. The thermal stability of this alloy (γ phase) at 400°C with a constant stress of 15,000 psi does not appear to be effected. X-ray examination of a number of UO_2 samples was completed for samples with O/U ratios greater than 2. A large decrease in the unit cell size with increasing O/U ratio was not observed. Radiation effects on a number of UO_2 samples fabricated in different ways are reported. Other radiation testing was continued on U–Nb, U–Mo, and Zircaloy-2 clad U–Nb alloys. The effect of water, impurities, defect size, and stress on corrosion of U–12 wt. % Mo were studied. Corrosion studies were also made on U–Mo–Pt alloys, U–Nb alloys, and clad fuel elements. Work was continued on the preparation of UO_2 by various methods and on the physical and chemical properties of UO_2. In-pile loops were used for UO_2 defect tests and U/Mo defect tests. The mechanism and consequences of PWR fuel element rupture due to waterlogging were studied. Coolant contamination was studied and decontamination and waste disposal procedures were discussed. Shielding, criticality, and design studies were continued. (D.E.B.)

7480 WAPD-MRP-57(Rev.)

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

PRESSURIZED WATER REACTOR PROGRAM TECHNICAL PROGRESS REPORT FOR THE PERIOD SEPTEMBER 9 TO OCTOBER 20, 1955. Decl. Mar. 16, 1957. 95p. Contract AT-11-1-GEN-14. $0.60.

Progress in the design, development, and construction of PWR power plant systems and components and PWR core and auxiliaries is summarized. The blanket assembly design is described and illustrated. Results of MTR evaluation of fuel element failure instrumentation are reported. Development of fabrication and testing techniques for clad fuel elements, fuel rods, plates, and assemblies is described. Investigations of fuel and cladding alloys include crystal structure and thermal stability determinations on U–Mo alloys, studies on the nature of the hydride phase formed during corrosion of γ-phase alloys in high-temperature water, and specific heat, resistivity, and phase diagram studies of U–Mo and U–Nb alloys. The equilibrium and kinetics in the system UO_2–O_2 are being studied to gain information on the structure and stability of UO_2 under various conditions. Results of irradiation tests on UO_2 samples and of thermal cycling tests of Zircaloy-2 clad UO_2 rods are reported. Corrosion test results are summarized for unclad and Zircaloy-2 clad U–Mo and U–Nb samples. The radiation induced volume change of prototype fuel rods has been investigated. Studies of the fabrication, cladding, tensile properties, and corrosion of U–Si systems are described. Corrosion tests are continuing on Zircaloy-2 clad U–Zr fuel elements and on various experimental Al alloys for cladding applications. Work was continued on the preparation, corrosion, and sinterability of pure UO_2 and UO_2 containing additives. Operation and chemical analysis of in-pile loop experiments are described. Results are reported from studies of the erosion of UO_2 in high-velocity coolant, decontamination of water by ion exchange resins, sorption of radioisotopes on stainless steel, and decontamination of corrosion loops. Work in reactor physics has included PWR control calculations using a 2-dimensional UNIVAC code, calculation of fission product activity in the primary coolant, and criticality studies on the Flexible Critical Experiment and on a lattice of UO_2 fuel rods in the TRX. Current PWR plant parameters are recapitulated. (D.E.B.)

7481 WAPD-MRP-61

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

PRESSURIZED WATER REACTOR PROGRAM TECHNICAL PROGRESS REPORT FOR THE PERIOD FEBRUARY 23, 1956 TO APRIL 23, 1956. Changed from OFFICIAL USE ONLY Mar. 6, 1957. 85p. Contract AT-11-1-GEN-14. $2.25(OTS).

PWR Engineering. Core 2 design heat output was placed at 1.18×10^9 Btu/hr. This will allow a gross generator output of 100 Mw. Changed or modifications in coolant system pumps, valves, and tank capacities are discussed. The effects of a daily load cycle on plant operation with respect to Xe buildup were investigated and are summarized. Increased core loading and operating at a minimum power level rather than complete shutdown appear advisable. Progress in plant construction is reviewed. Additional tests were conducted on the roller nut-type control rod mechanism. Wear rates continue to be satisfactory at increased scram rates. Minor modifications were made in the core cage and blanket assembly specifications to relieve possible excessive stresses. These modifications are discussed. Reactor instrumentation system components were analyzed to establish the adequacy of their indications. Where performance was not satisfactory, the required improvements are considered. Flow tests in the model pressure vessel show flow variations of less than 7% for all but five tubes. These five excessive variations are being investigated. The fabrication status of the full scale pressure vessel is reviewed. PWR Development. Fuel element fabrication and inspection are reviewed, and the status of fuel bundle assembly and testing is given. Metallurgical studies of fuel and cladding materials were continued. Recent developments in these studies are presented. Equilibrium studies on UO_2–O_2 systems indicate several phases in the temperature range 200 to 700°C. Fission gas release from UO_2 and UO_2 self-diffusion studies are also reported. Radiation effects studies on ceramic and metallic fuel specimens were continued. Results are given for completed tests, and the status of current tests is reported. Progress in the development of fission product removal and waste disposal methods is reviewed. Core and control calculations were reviewed for a 75 kg loading. Reactivities and lifetimes are discussed. Critical experiments for determining PWR characteristics are also reviewed. (D.E.B.)

7482 WAPD-MRP-72

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

PRESSURIZED WATER REACTOR (PWR) PROJECT TECHNICAL PROGRESS REPORT FOR THE PERIOD DECEMBER 24, 1957 TO FEBRUARY 23, 1958. 66p. Contract AT-11-1-GEN-14. $2.00(OTS).

The results of corrosion testing of Auric Brazes (24 K gold, 80-20 gold-copper, 50-50 gold-copper) indicate that from a corrosion standpoint there is little or no difference among the three alloys. A computer program was established for determining subassembly pressure and thermal stresses in Seed 2. Preliminary data from all of the in-

stalled seed metal thermocouples proved unreliable. Nuclear peaking factors were evaluated for the beginning of Seed 2 life (hot clean) for various conditions of loading. Satisfactory performance tests demonstrating the adequacy of the reactor vessel closure seal weld cutting machine for the vessel to seal cut were performed. Preliminary results of the nuclear analysis of the 20 control rod core under study for Core 2 indicated that the proposed design would yield an unfavorable seed-blanket power sharing. Air flow studies in a quarter-scale model of the pressure vessel and simulated internal components were completed. Effort on fuel element design was concentrated on determining the factors which will lead to the selection of the most desirable ceramic fuel for the Core 2 blanket from the standpoint of performance capability, mechanical stability, and cost. Progress has been made in the development of a nondestructive method of U^{235} assay of fuel fillers. Fission gas release measurements on samples of $UO_{2.10}$ showed no acceleration of fission gas release as compared to the release from $UO_{2.0}$. Examination of the failed WAPD 29-10 sample indicated profuse hydride formations in the Zircaloy-2. Analyses indicated the presence of 4000 ppm of hydrogen in these regions. No gross hydride pickup or irradiation induced embrittlement were discerned in the Zircaloy of the WAPD 30-3 fuel elements. PWR Core 2 fuel element samples were fabricated with 100% integrity using an improved fabrication process. Modifications in the reference Ag–In control rod alloy resulted in marked improvements in strength properties. The estimated activation energy for Kr^{85} diffusion in high density UO_2 is 61.2 kcal/mole. Seed 2 reactivity lifetime studies were completed for two proposed seed loadings. Based on a reactivity lifetime of 6000 EFPH for Core 1, Seed 1, the reactivity lifetime of a 90 kg Seed 2 with 150 grams of natural boron is predicted to be approximately 7400 EFPH. (For preceding period see WAPD-MRP-71.) (D.E.B.)

7483 WAPD-PWR-PA-626

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

FLOW COASTDOWN TEST OF THE PWR MAIN COOLANT PUMP. H. B. Ketchum. Aug. 30, 1956. 75p. $12.30(ph OTS); $4.50(mf OTS).

Attached to this report is a letter (WAPD-PWR-PA-658) by J. E. Nolan, containing pertinent information. 2p.

A series of flow coastdown tests were run on an AED loop at Cheswick. This loop had the PWR prototype pump installed for the tests. All tests were run using hot pressurized water at 2000 psig and 505 to 510°F. The initial flow rates were varied from 2000 to 20,000 gpm, some of which were within the pump at half speed and some with the pump at full speed. Variable data collected consisted of pump head, loop flow, and pump motor voltage decay in continuously recorded form. The tests were run to obtain further information about the flow coastdown mechanism and to evaluate the theoretical methods of calculation of flow coastdown. This report presents the raw and reduced data obtained and a brief analysis of the data. A further analysis of the data is contemplated and desirable. The experimental data confirmed the fact that fluid flow continues after the impeller stops. It was found that the ratio of the kinetic energy of the pump impeller to the kinetic energy of the water was not constant during coastdown as had been assumed in the theoretical method of calculation. This requires that the method be reviewed in light of the facts obtainable by analysis of the data. The experimentally obtained curve was fitted mathematically more closely by a hyperbolic rather than exponential curve. The theoretical method of calculation employs an exponential curve. There is an energy transfer from the impeller to the water during coastdown until the impeller bearing film fails. The comparison of an experimental coastdown curve with a corresponding curve calculated for the Cheswick loop was satisfactory to the point of bearing film failure even though the theoretical method is now known to be in error. An improved agreement between the calculated and experimental curve for longer times after coastdown should result from a correction of the method of calculation. A further analysis of the data should yield more details of the flow coastdown mechanism and allow the derivation of a more accurate method of calculation. (auth)

7484 WAPD-PWR-PA-2025

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

PWR FLOW COASTDOWN CURVES FOR SIMULTANEOUS LOSS OF ALL FOUR OR ALL THREE PUMPS. H. B. Ketchum. Oct. 15, 1957. 5p. $1.80(ph OTS); $1.80(mf OTS).

Flow coastdown curves are given for the Shippingport Pressurized Water Reactor Plant (PWR) with core 1 installed at four loop and three loop operation under assumption of simultaneous power loss to all pumps operating. The calculation of the flow coastdown curves was carried out only for a 15-second time interval. It is expected that flow will continue after 15 seconds, with the check valve hung open. Natural convective circulation will maintain some flow as a result of decay heat from the core, when the flow coastdown rate approaches that consistent with the thermal driving head. (W.L.H.)

7485 WKNL-46(Del.)

Kidde (Walter) Nuclear Labs., Inc., Garden City, N. Y.

A CONCEPTUAL STUDY OF A 100 KW GAS COOLED REACTOR POWER PLANT FOR A REMOTE LOCATION. J. H. Frankfort. May 31, 1955. Decl. with deletions May 7, 1957. 179p. Contract AT(11-1)-339. $4.50(OTS).

An analysis and design study is presented for a gas-cooled reactor suitable for supplying 100 kw of electrical energy and 400 kw of heat to a distant early warning radar station. The graphite reflector-moderated reactor with UO_2–stainless steel fuel elements is helium cooled. The helium is also the working fluid for a closed cycle regenerative gas turbine power plant. The plant, which requires only one operator at the console at all times, is designed for packaging in the continental United States, shipment by air to a remote base, and erection on a permafrost site during the four-month construction season. (J.S.R.)

7486 YAEC-44

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

QUARTERLY PROGRESS REPORT FOR THE PERIOD JULY 1, 1957 TO SEPTEMBER 30, 1957. I. H. Coen and R. W. Garbe. Oct. 30, 1957. 103p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1.

Work was continued toward the development of satisfactory stainless steel clad UO_2 fuel elements. Specific information is given on the preparation of UO_2 pellets, fuel rod end-closure, and fuel bundle assembly. Results are given from studies of the corrosion of various brazing alloys by water and the effects of annealing on the tensile properties of stainless steel. Additional studies and calculations on core design optimization and kinetic and steady-state reactor analysis are given. An in-pile loop design for studying radiation effects is included. (For preceding period see YAEC-35.) (D.E.B.)

7487 YAEC-54

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

MONTHLY PROGRESS REPORT FOR THE PERIOD JANUARY 1 TO 31, 1958. I. H. Coen and R. W. Garbe.

Feb. 20, 1958. 12p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph OTS); $2.40(mf OTS).

Progress in the design and development of the Yankee Power Reactor and its components is briefly reviewed. (For preceding period see YAEC-52.) (W.L.H.)

7488 NP-tr-62

APPLICATION OF NUCLEAR ENERGY IN SHIPBUILDING AND SHIP PROPULSION. F. Richter. Translated from Handelskammer Bremen, Mitteilungen, No. 11, 187-90 (1957). 6p.

The application of nuclear energy to shipbuilding and ship propulsion is being studied in four northwestern coastal provinces of Germany. A study group has been organized and an order placed for a swimming pool research reactor to be ready in the autumn of 1957. Future plans call for the construction of a power reactor also. The organization is supported jointly by the federal government, the provincial governments, and interested industries. It is assumed that the financial backing for the power reactor will come chiefly from industry. The first major research program will be on the suitability of materials as radiation shields. (J.S.R.)

7489

INVESTIGATIONS ON THE POSSIBILITY OF LOCALLY INCREASING THE NEUTRON FLUX IN A REACTOR. Gerhard Locke. Atomkern-Energie 3, 89-94(1958) Mar. (In German)

Inasmuch as the maximum attainable thermal neutron flux in a given reactor is too low for the tests determining radiation, it is desirable to have a small chamber in which the thermal flux is locally greater than in the rest of the reactor. One can then suggest the introduction of a chamber into the reactor whose walls consist of a fissionable material (U^{235}, Pu^{239}, etc.). From the neutron flux in the reactor, a chain reaction would be released in the chamber walls, which leads to a local increase of the flux in the chamber and its surroundings. To prevent a reaction of this local flux increase on the rest of the reactor, the chamber must be surrounded with a neutron absorbing layer which would suppress a notable thermal flux increase outside the chamber. (tr-auth)

7490

ON THE CALCULATION OF THE COOLING EFFICIENCY OF REACTOR COOLING CHANNELS. H. Benzler. Atomkern-Energie 3, 94-6(1958) Mar. (In German)

7491

MATERIAL AND CORROSION PROBLEMS IN A REACTOR WITH LIQUID METALS AS COOLANT. Willibald Machu (Universität Cairo). Atomkern-Energie 3, 97-100(1958) Mar. (In German)

The first part of a series on material and corrosion problems in a liquid metal cooled reactor is presented. The behavior of different materials in liquid sodium and calcium is discussed. (J.S.R.)

7492

THE ATOMIC SUBMARINE "NAUTILUS." S. V. Atomnaya Energiya No. 1, 111-13(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3347).

7493

CONSTRUCTION OF RESEARCH REACTORS IN ENGLAND. Atomnaya Energiya No. 3, 141-3(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3313).

7494

THE RESEARCH REACTOR OF SAN PABLO, BRAZIL. Bol. Inform. Junta Control Energia Atomica 3, 29-39(1958) Jan.-Feb. (In Spanish)

The new research reactor at the University of San Pablo has been constructed. The swimming pool reactor, water cooled and moderated, uses 20% enriched uranium. The reactor building and the characteristics of the reactor are described. (J.S.R.)

7495

ON REACTORS WITH MINIMUM CRITICAL MASS. Jacques Devooght (Faculté des Sciences Appliquées, Brussels). Bull. classe sci. Acad. roy. Belg. 43, 653-62 (1957). (In French)

The problem of the determination of the distribution of fissile material corresponding to a distribution of moderator material and to a given flux of neutrons is solved for the case of two half spaces separated by a plane surface for the transport equations of Boltzmann with one neutron group. The solution is generalized for thermal neutrons. (tr-auth)

7496

FUEL CIRCULATION IN NATURAL URANIUM AND GRAPHITE REACTORS. G. Ghilardotti. Energia nucleare (Milan) 5, 95-103(1958) Feb. (In Italian)

The latest designs of natural uranium and graphite reactors are compared with the Calder Hall prototype, mainly in regard to the introduction in a reactor of a charge-and-discharge system without interrupting the reactor operating cycle. Several schemes are given; the basic and simplest one consists in a continuous charging and discharging. A few processing operations may be added to this basic performance in order to reach a more favorable displacement of fuel for the purpose of obtaining a better uniform thermal irradiation and of increasing the average irradiation. Two fundamental displacements have been studied, i.e., axial inversion of canal elements and radial transfer of fuel from the periphery into the central zone of a reactor core. Calculation methods and results are outlined, as were obtained by means of a particular reactor having a radially flattened flux distribution. (auth)

7497

CRITERIA FOR CHOICE OF A NUCLEAR MODERATOR WITH PARTICULAR REFERENCE TO GRAPHITE. G. Gandusio, P. Palmieri, and P. M. Strocchi. Energia nucleare (Milan) 5, 105-15(1958) Feb. (In Italian)

In the first part of this paper an account is given of those flux equations which deal with the various characteristics of the moderating material in a nuclear reactor. Various moderators are evaluated theoretically, and a table is given of values of certain of these characteristics. In the second part of the paper the present position of graphite as a moderator is reviewed and its chemical properties are examined and discussed with respect to the working conditions of the reactor. In particular, are considered: (1) the oxidation of graphite (of interest in the case of CO_2 cooled reactors); (2) the formation of lamellar compounds (from metallic elements in the case of molten metals or alloys used as thermo-conducting fluids); (3) the carbiding reaction. A brief summary is given of several possible methods for improving the characteristics of graphite. Finally, a comparison is made of the extent to which the various moderators are used in the existing or projected reactors in a number of countries. (auth)

7498

CONTROL IN SOME TYPES OF NUCLEAR POWER REACTORS. A. Tescari. Energia nucleare (Milan) 5, 117-30 (1958) Feb. (In Italian)

This paper deals with regulation and control systems in nuclear power reactors. Only two types of reactors are considered, owing to the limited time available: the natural uranium reactor, moderated by graphite and cooled by CO_2, and the enriched uranium reactor, moderated and cooled by pressurized natural water. After a brief revision of such reactors characteristics, the author examines the regula-

tion and control problems from a general point of view although some data are also reported referring to the English 200 electric Mw power reactor and the American PWR ALCO 10 electric Mw power reactor. A brief hint is also made to electronic and nuclear equipment. (auth)

7499

FUEL CYCLING IN NUCLEAR POWER REACTORS. P. J. Grant. G.E.C. Atomic Energy Rev. 1, 125-9(1958) Mar.

After a brief account of the changes that occur in the composition of nuclear fuel in an operating reactor, the effect that these have on the reactivity is discussed. Consideration is then given to the effects of different neutron flux distributions and to the extra burn-up that can be obtained by moving the fuel from one part of the reactor to another, particularly by 'axial shuffling'. Mention is made of the influence of metallurgical limitations on the fuel cycle. (auth)

7500

HEAT TRANSFER WITHIN REACTOR FUEL ELEMENTS. R. G. S. Skipper. G.E.C. Atomic Energy Rev. 1, 141-6 (1958) Mar.

A typical fuel element for a gas-cooled nuclear reactor consists of a cylindrical rod of uranium sealed into a can of magnesium alloy. Heat produced in the uranium by fission is removed by gas flowing over the can, and in consequence there is a temperature drop between the center of the rod and the inside of the can. This consists of two parts: the drop due to heat conduction in the uranium; and the drop due to contact resistance between the fuel and the can. The method of calculating the first of these is outlined, and experiments to measure the second are described. (auth)

7501

THE SPECIFICATION OF FAULT CONDITIONS FOR GAS-COOLED GRAPHITE-MODERATED REACTOR SYSTEMS. T. J. O'Niell. G.E.C. Atomic Energy Rev. 1, 166-73(1958) Mar.

A catalog of possible faults that could occur in gas-cooled graphite-moderated reactors is presented; the fundamental causes and prevention of reactor accidents are discussed. (W.D.M.)

7502

A MODERATOR-CONTROLLED ORGANIC-COOLED REACTOR. Henri Polak. Ind. Atom. 2, 68-76(1958). (In French)

A description is given of the construction and performance of an organic-cooled moderator-controlled reactor. Diagrams of the first and second circuits of the OMR power plant for 11.4 net megawatts and the first and second circuits of the OMR marine propulsion reactor are shown. (R.V.J.)

7503

DIORIT, A HEAVY WATER RESEARCH PILE. W. Zünti, A.-F. Fritzsche, P. Schmid, and F. Staub. Ind. Atom. 2, No. 3-4, 34-49(1958). (In French)

The design of the DIORIT, a Swiss heavy water research reactor, is described. The reactor uses natural uranium as fuel and is designed to give a maximum flux of 2.2×10^{13} nvt. It is expected that the reactor will be placed in operation in 1959. (J.S.R.)

7504

CALCULATION OF CRITICAL DIMENSIONS OF A NUCLEAR REACTOR AND SIMULTANEOUS DETERMINATION OF NEUTRON FLUXES. F. Versini and M. Renaudie. Ind. Atom. 2, No. 3-4, 54-62(1958). (In French)

A method is given for the rapid and simultaneous calculation of the neutron flux and the critical dimensions of a reactor. (J.S.R.)

7505

NUCLEAR PILE CENTER OF KARLSRUHE AND THE PILE FR 2. Francis Gérard. Ind. Atom. 2, No. 3-4, 63-72(1958). (In French)

The construction and design of the German heavy water research reactor at Karlsruhe is described. It is the first reactor of German design and construction and is designed as the first of several research reactors to be built at this site. The enterprise is jointly financed by the federal government, the provincial government, and private industry. (J.S.R.)

7506

EXPERIMENTAL FACILITIES FOR PROTECTION STUDIES. J. Bourgeois and P. Lafore. Ind. Atom. 2, No. 3-4, 73-6 (1958). (In French)

The research reactor at Fontenay-aux-Roses for the study of shielding, radiation effects, and neutron age in various materials is described. (J.S.R.)

7507

MODEL TESTS FOR NUCLEAR PROBLEMS. Richard A. Fayram (Aerojet-General Nucleonics, San Ramon, Calif.). 9th Intern. Congr. on Appl. Mech. 1, 96-105(1957).

A number of similitude experiments for solving problems in nuclear technology are reviewed. In particular, exponential experiments and time and space analogs are considered. The need for greater attention to the development and application of the principles of dimensional analysis and related techniques in reactor engineering and design is also suggested. 28 references. (J.S.R.)

7508

A THERMAL CYCLE FOR NUCLEAR POWER PLANT WITH GAS COOLED REACTOR. Jan Juza (V. I. Lenin's Plant, Pilsen). Jaderna Energie 4, No. 1, 2-9(1958) Jan. (In Czech.)

The effects of the cooling gas temperature at the reactor inlet, reheating of vapor from the low pressure turbine, and preheating the feed water on the efficiency of one or two stage vapor cycles generated in a steam generator and on the circulating gas blower input were evaluated. The influence of the parameter changes, the costs of primary cycle, and the breeding of nuclear fuel were not considered. The results showed that the suggested thermal cycle with two pressure stages (70 to 160 atm. and 15 to 25 atm.) with preheating of the feed water and reheating of vapor affected the gas temperature of 175 to 250°C at the inlet and of 400 to 500°C at the outlet of the reactor. The thermal efficiency of the power plant was 27.6 to 32.6%. (tr-auth)

7509

PILSEN CONFERENCE ON THE CONSTRUCTION OF LARGE PARAMETER TURBOGENERATORS FOR COAL AND NUCLEAR POWER STATIONS. J. Drahy. Jaderna Energie 4, No. 1, 28(1958) Jan. (In Czech.)

7510

DETERMINATION OF REACTOR POWER BY COOLANT ACTIVITY MONITORING. Eugene E. Drucker (Syracuse Univ., N. Y.) and William D. Wallace. Nuclear Sci. and Eng. 3, 215-31(1958) Mar.

The applicability of a power-range instrument based on coolant gamma activity is discussed, indicating considerable merit for certain systems, but with some limitations. A general equation is presented for equilibrium coolant activity at reactor discharge. The effect of changing flow rate at fixed power is shown to influence detector reading. The effect of time lag between reactor outlet and detector is shown to introduce error, but that optimum location of the detector will minimize the total detector error. Transient response to step power and to step flow changes are evaluated. Analysis is applied to a water-cooled system

and experimental data shown to verify predicted behavior. Effects of coolant impurities are discussed. (auth)

7511

METALLURGICAL PROBLEMS IN FABRICATION OF ZIRCONIUM-CLAD FUEL ELEMENTS FOR PRESSURIZED WATER REACTORS. R. B. Gordon (Westinghouse Electric Corp., Pittsburgh). Nuclear Sci. and Eng. 3, 232-49 (1958) Mar.

To achieve adequate corrosion resistance in high-temperature water, the chemical composition and fabrication of zirconium cladding material must be carefully controlled. Present technology permits the satisfactory fabrication of a variety of fuel materials which are compatible with zirconium cladding. Homogeneity and melting crucible problems still exist with some of the fuel alloys. Zirconium-clad fuel elements of the bonded type are produced by pack rolling or coextrusion of the fuel and cladding. The optimum working temperature represents a balance between the need for minimizing differences in plasticity between fuel and cladding and for adequate diffusion at the clad-fuel interface. Unbonded fuel elements require close dimensional control of fuel and cladding and high-quality closure welds which are made possible by the excellent welding characteristics of Zircaloy. (auth)

7512

CALCULATIONS OF NEUTRON DISTRIBUTIONS BY THE METHODS OF STOCHASTIC PROCESSES. Carl N. Klahr (Nuclear Development Corp. of America, White Plains, N. Y.). Nuclear Sci. and Eng. 3, 269-85(1958) Mar.

A new method of calculating steady-state neutron distributions in moderator materials is developed using the method of stochastic processes. In this method neutron life histories are considered as stationary Markoffian time series. The probability distribution for the neutron to be in a particular point in phase space as a function of time from neutron birth is then found by solving an appropriate Fokker-Planck equation whose coefficients depend on the one-collision probability distributions. This method has important applications to calculations of flux spectra and to shielding problems involving deep neutron penetration. When simplifying approximations are made, solutions for the flux have the correct qualitative features of the Boltzmann equation solutions. Quite good quantitative agreement is obtained with the Bethe-Tonks-Hurwitz solution of the Boltzmann equation. Effects of absorption, anisotropic scattering, and a mixture of materials can also be included. By the present method the neutron flux distribution can be calculated in position, lethargy, velocity angle, and possibly other variables, for a homogeneous infinite moderating medium at both large and small distances from the source. The neutron flux spectrum from an infinite plane source in an infinite medium has been calculated, as well as the angular distribution of the neutrons. Constant cross sections and high atomic weight are assumed but it is pointed out that these restrictions can both be relaxed. (auth)

7513

THE EFFECTIVE RESONANCE INTEGRAL OF THORIUM AND THORIUM OXIDE. I. E. Dayton and W. G. Pettus (Babcock and Wilcox Co., Lynchburg, Va.). Nuclear Sci. and Eng. 3, 286-95(1958) Mar.

The effective resonance integral has been measured for thorium metal rods and plates and for ThO_2 rods of two different densities. Measurements were carried out in a cadmium tube in the center of a swimming-pool type research reactor using conventional "danger coefficient" techniques. Absolute calibration was obtained by the use of boron samples. (auth)

7514

WORTHS OF BLACK CONTROL RODS. Wm. Howard Arnold, Jr. (Westinghouse Atomic Power Dept., Forest Hills, Penna.). Nuclear Sci. and Eng. 3, 296-9(1958) Mar.

A simple method is presented for calculating full insertion worths of individual black control rods in thermal neutron reactors. Both cruciform and cylindrical rods are treated by a perturbation method which allows for the depression in the perturbed flux in the vicinity of the control rods. The method leads to a simple formula for the worth of a central cruciform rod. (auth)

7515

THE EFFICIENCY OF COMPOSITE FINS. James J. Barker (Walter Kidde Nuclear Labs., Inc., Garden City, N. Y.). Nuclear Sci. and Eng. 3, 300-12(1958) Mar.

The fin efficiency, defined as the ratio of the average temperature of the surface of the fin to the temperature at its base, is derived for flat and for circular fins composed of two or more materials (such as copper clad with stainless steel), for the usual conditions of constant heat transfer coefficient h and uniform ambient temperature. The exact solution is in the form of an infinite series, but the terms beyond the first are usually negligible. For most cases of interest, the fin efficiency η is shown to be approximated closely by the familiar equation $\eta = (\tanh \alpha L)/\alpha L$, where $\alpha = \sqrt{hP/\bar{k}A}$, and L, P, and A are, respectively, the length, perimeter, and cross-sectional area of the fin, and $\bar{k}$ is the volumetric average thermal conductivity of the fin, $\bar{k} = \Sigma\, k_i A_i / A$ where k_i and A_i are the conductivity and cross-sectional area of the region i. (auth)

7516

TWO-DIMENSIONAL (r,z) MULTIGROUP CALCULATION FOR AN INTERMEDIATE SPECTRUM CRITICAL ASSEMBLY. P. L. Hofmann and M. L. Storm (Knolls Atomic Power Lab., Schenectady, N. Y.). Nuclear Sci. and Eng. 3, 313-38(1958) Mar.

The results of two-dimensional (r,z) multigroup calculations of an experimental low-power reactor (PPA-19) are described. Comparison is made between calculated results and experimental measurements of reactivity, power distribution, and sodium activation. Generally good agreement is observed between calculation and experiment. This calculation was performed in 1954 and represents the first application of Roe's two-dimensional multigroup formulation to the analysis of an operating critical assembly. The over-all objective of such calculations is to ascertain the accuracy of two-dimensional multigroup methods in order to facilitate their application to future problems in reactor design. (auth)

7517

SOME REMARKS ON HEAT REMOVAL FROM ENERGY REACTORS. J. H. M. Haagh. R C N Bull. 2, 16-19(1958) Feb. (In Dutch)

7518

BASIC PLANNING OF NUCLEAR REACTORS AND USE OF EXPERIMENTAL REACTORS. Carlo Salvetti. pp. 43-75 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The steps in the basic planning of a reactor are illustrated, beginning with the selection of the type of reactor—power, breeder, or research. The mechanism of the chain reaction is briefly considered, and then the calculation of the multiplication factor is reviewed. The theory is next applied to the dimensional calculations of a real reactor. The multigroup reactor theory is also considered. The use of exponential and criticality experiments in the planning of a reactor is shown. Contributions made to reactor technology by research reactors are briefly reviewed. (J.S.R.)

7519

TECHNOLOGICAL PROBLEMS OF THE CONSTRUCTION OF NUCLEAR REACTORS. Alberto Pedretti. pp. 77-103 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956, 447p. (In Italian)

A brief and general survey is made of the technological problems which must be solved for reactor construction. Some areas of research are indicated. (J.S.R.)

7520

PROBLEMS OF ADJUSTMENT AND CONTROL CONNECTED WITH THE USE OF NUCLEARS REACTORS. Emilio Gatti. pp. 115-28 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The regulation and control of reactors consist of the regulation and control of K, the reactivity. The effects of pressure, temperature, and poisoning on this parameter are discussed, and methods of controlling them described. (J.S.R.)

7521

POWER REACTORS: ACTUAL TECHNIQUES. Mario Silvestri. pp. 129-46 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The technology of power reactors is surveyed by a discussion of the advantages and disadvantages of various types of reactors. The types reviewed are the natural uranium, graphite moderated, gas cooled reactors (such as the Calder Hall), water moderated reactors (such as the Pressurized Water Reactor), organic moderated reactors, and liquid metal cooled reactors (such as the Sodium Reactor Experiment). The Experimental Breeder Reactor is mentioned as a possible reactor type for future exploitation for power production. (J.S.R.)

7522

EXAMINATION OF THE CHARACTERISTICS AND OF THE ECONOMICAL VALUE OF NUCLEAR ENERGY AS COMPARED WITH OTHER SOURCES OF ENERGY. Arnaldo Maria Angelini. pp. 231-71 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The economic aspects of nuclear power are reviewed with special emphasis on the individual needs of the various countries. 25 references. (J.S.R.)

7523

ON THE LOCATION OF NUCLEAR POWER STATIONS. Marcello Quojani. pp. 273-84 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The primary considerations in the location of nuclear power stations are that the station be in proximity to the center of an electrical system and that it be near large available sources of water. Other important considerations are ease of disposing of spent fuels, population in the area, and geological and meteorological factors. (J.S.R.)

Nuclear Transformation

7524

REMARKS ON THE $Li^6(n,d)He^5$ REACTION. J. Dabrowski and J. Sawicki. Bull. Acad. Polon. Sci. Classe (III) 3, No. 2, 91-4(1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3235).

7525

POLARIZATION OF NUCLEONS IN PHOTONUCLEAR REACTIONS. V. Chizh and G. Savitskiy. Byull. Pol'skoy Akad. Nauk Otdel. 3, 4, No. 3, 137-41(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 3163).

7526

NEUTRON SPECTRA EMITTED DURING THE (n,2n) REACTION IN Mn^{55}, I^{127}, AND Ta^{181}. Ernst Remy and Klaus Winter. Compt. rend. 246, 1410-13(1958) Mar. 3. (In French)

The neutron spectra emitted in the (n,2n) reaction of Mn^{55}, I^{127}, and Ta^{181} were measured by the time of flight method. The groups of neutrons between 1.0 and 1.3 Mev are resolved. (tr-auth)

7527

(γ,γ) ANGULAR CORRELATION IN THE REACTION $N^{14}(p,\gamma)O^{15}$. S. Gorodetzky, A. Gallmann, and M. Croissiaux (Institut de Recherches Nucléaires, Strasbourg). J. phys. radium 19, 16-17(1958) Jan. (In French)

The resonance at 1,060 kev in the $N^{14}(p,\gamma)O^{15}$ reaction has been investigated. Three $\gamma-\gamma$ angular correlations in the cascade 8.34 Mev to 5.27 Mev to 0 have been measured. The experimental results agree with the values $J = 3/2$ or $J = 5/2^+$ for the angular momentum of the 5.27 Mev level. (tr-auth)

7528

FORBIDDEN ELECTRIC DIPOLAR TRANSITIONS IN THE DISINTEGRATION $Tb^{161} \rightarrow Dy^{161}$. Michel Vergnes (Collège de France, Orsay). J. phys. radium 19, 36-8(1958) Jan.

Three photons of 25.5, 49, and 74.5 kev have been found. The first two form a cascade, the third one being the crossover. Two levels are thus defined at 25.5 and at 74.5 kev. The periods of these levels have been measured. The measurement of the conversion coefficients allows the determination of the nature of the two transitions of 25.5 and 74.5 kev, as both being E1 (+ M2). The probabilities of these two transitions are very small compared with those obtained by the formula of Weisskopf. A level scheme is given. (tr-auth)

7529

ANGULAR DISTRIBUTION OF PROTONS FROM THE REACTION $Mg^{24}(d,p)Mg^{25}$. G. R. Bishop, P. Demay, and F. Demichelis. J. phys. radium 19, 46(1958) Jan. (In French)

The angular distributions of the proton groups resulting from the reaction $Mg^{24}(d,p)Mg^{25}$ for bombarding energies between 1 and 2 Mev were measured. The results show that both stripping and compound nucleus formation contribute to the reaction. Formation of the compound nucleus Al^{26} is confirmed by an excitation curve which shows distinct resonances. (tr-auth)

7530

STUDY OF SOME γ TRANSITIONS IN THE NUCLEUS Si^{29} IN THE REACTION $Si^{28}(d,p)Si^{29*}(\gamma)Si^{29}$. S. Gorodetzky, Th. Muller, M. Port, and G. Bergdolt (Institut de Recherches Nucléaires, Strasbourg). J. phys. radium 19, 49-50(1958) Jan. (In French)

The γ transitions in the nucleus Si^{29} were studied by the reaction $Si^{28}(d,p)Si^{29*}(\gamma)Si^{29}$. The branching ratio for the second excited state are: 99.5% of the transitions are direct to the ground state; 0.5% are through the first excited state. For the third excited state these values are respectively, for the direct transition, greater than 40%; for the cascade transition through the first excited state less than 60%. (tr-auth)

7531
TOTAL p-d CROSS SECTION FROM 390 TO 650 Mev. V. P. Dzhelepov and V. I. Moskalev (Inst. for Nuclear Problems, Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 565-7(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3583.

7532
NUCLEAR LEVELS OF Li^6. Iu. L. Sokolov, M. M. Sulkovskaia, E. A. Al'bitskaia, and E. I. Karpushkina. Soviet Phys. (Doklady) 1, 773-6(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4127.

7533
FISSION OF NUCLEI UNDER THE INFLUENCE OF ACCELERATED NITROGEN NUCLEI. V. A. Druin, S. M. Polikanov, and G. N. Flerov. Soviet Phys. JETP 5, 1059-64(1957) Dec. 15.

Experiments on fission induced in U^{235}, U^{238}, Bi, Au, Re, and Yb by accelerated nitrogen ions are described. The measurements were conducted with the aid of an ionization chamber. Graphs are presented showing the dependence of the fission cross sections for these nuclei on the nitrogen ion energy in the energy range from 70 to 110 Mev. The results obtained are analyzed from the viewpoint of influence of the parameter Z^2/A and of the excitation energy on the probability of fission. (auth)

7534
ON THE ANGULAR DISTRIBUTION OF DEUTERONS FROM THE $Be_4^9(pd)Be_4^8$ REACTION. D. P. Grechukhin. Soviet Phys. JETP 5, 1188-91(1957) Dec. 15.

It is shown that even at proton energies ≥ 8 Mev the main contribution is from the region within the Be^9 nucleus. This significantly modifies the deuteron angular distribution, good agreement with experiment being obtained for proton energies of ≈ 22 Mev with a Be^8 radius $r_0 = 5 \times 10^{-13}$ cm. (auth)

7535
PHYSICS OF NUCLEAR FISSION. SUPPLEMENT NO. 1 OF THE SOVIET JOURNAL ATOMNAYA ENERGIYA. Division II, Volume 2. E. Bretscher and Donald J. Hughes, eds. Translated from the Russian by J. E. S. Bradley. New York, Pergamon Press, 1958. 187p. $9.00.

Papers read at the Conference on the Physics of Nuclear Fission held at the Atomic Energy Institute of the U.S.S.R. Academy of Sciences are given. Titles included are: "Nuclear Fission Theory (Review)"; "Fast Neutron Fission Cross-sections"; Charge and Mass Distributions of Fission Products"; "Theory of Fission of Heavy Nuclei near Threshold"; "Anisotropy in Fission Processes"; "Fission Neutrons"; "Some Features of Nuclear Fission at High and Low Excitation Energies"; "High-Energy Proton Fission Cross-Sections for Uranium, and an Analysis of the Light Charged Particles Emitted"; "Determination of Emissive Fission Thresholds by the Thick-layer Photographic Plate Methods"; "Spontaneous Fission of Heavy Nuclei"; and "Photofission". (M.H.R.)

Particle Accelerators

7536 BNL-2930
[Brookhaven National Lab., Upton, N. Y.]
VACUUM SYSTEM FOR A 30 BEV ACCELERATOR. C. L. Gould. Sept. 24, 1956. 26p. $4.80(ph OTS); $2.70(mf-OTS).

The vacuum system of the proposed Brookhaven 30-Bev accelerator is described in detail. Each of the three major components—the system to be evacuated, the pumping system, and the valves, gages, controls, and auxiliary equipment—are discussed. (J.S.R.)

7537 NP-6631
Ateliers de Constructions Electriques de Charleroi. Centre Nucleonique, Belgium.
DYNAMIQUE DE L'ACCÉLÉRATEUR LINÉAIRE. (Dynamics of Linear Accelerator). Max Hoyaux. [1957?]. 119p.

Summary in English.

The linear acceleration of charged particles has been studied in as general conditions as possible, on the viewpoint of small oscillations around the "principal motion." The following results have been obtained. With a single travelling TM wave, phase stability and radial stability are not compatible. However, it is possible to catch electrons in phase with a single TM wave travelling with the speed of light. The phase tends asymptotically towards a limit value as the inverse square of energy; the beam expands radially as the logarithm of energy. Radial stability of an electron beam can be obtained by means of a longitudinal magnetic field. The beam radius remains approximately constant. For heavy particles, the field values are much too high. Long acceleration through a sequence of thin electrostatic lenses is impossible. At first order, phase stability and radial stability are uncompatible. In a very narrow and rapidly decreasing phase range, second order terms correspond to compatibility conditions, but the beam expands as the power (3/8) at least of energy. In the general case of a superposition of TM travelling and/or stationary waves, the exponent (3/8) may sometimes be replaced by (1/2), but at the same time, defocusing parasitic effects appear. Radial stabilization by means of thin foils or grids corresponds to a radial expansion of the beam as a power of energy comprised between (1/8) and (1/4). In the Berkeley device, the minimal value is attained. The acceleration through a sequence of independent cyclindrical cavities in TM_{010} mode corresponds to a contraction of the beam as the power (−1/8) of energy; but such a device is only practical for electrons. Radial stabilization by means of a coaxial structure with a d-c current in the linner part parallel to that of the beam corresponds to a radial contraction of the beam as the power (−1/8) of energy, but currents in excess of 10,000 amps are required in the case of heavy particles. Radial stability by means of a coaxial structure with d-c convenient bias allows the maintenance of the beam radius constancy. The d-c bias is at least 10,000 volts in the case of heavy articles. In every case, the amplitude of phase oscillations decreases as the power (−3/4) of time. Energy transfer is possible from phase to radial oscillations if the ratio between frequencies is even. The ratio (2/1) seems the most dangerous. (auth)

7538 UCRL-1216
California. Univ., Berkeley. Radiation Lab.
LINEAR ACCELERATOR BEAM DYNAMICS. Wolfgang K. H. Panofsky. Feb. 1951. 32p. Contract W-7405-eng-48. $0.15(OTS).

General equations of motion of a charged particle, basic geometry of the linear accelerator, synchronous conditions, types of stability for a "long" accelerator, the "incompatibility" theorem, velocity focusing, radial oscillations, phase oscillations, large oscillations, and unstable operation are treated. (D.E.B.)

7539 UCRL-3912
California. Univ., Berkeley. Radiation Lab.
DESIGN AND CONSTRUCTION OF THE BEVATRON. William M. Brobeck. Sept. 13, 1957. 48p. Contract W-7405-eng-48. $1.50(OTS).

This report summarizes the design and construction of

the Bevatron (6-Bev proton synchrotron) with emphasis on the engineering problems. It includes specifications, outline drawings, and a bibliography of other reports concerning the subject. Operating results and changes made after the initial start-up in February 1954 are mentioned only briefly. (auth)

7540

ON THE MOST ADVANTAGEOUS USE OF THE NEW ACCELERATING DEVICES OF NUCLEAR PHYSICS. K. Simonyi. Acta Tech. Acad. Sci. Hung. 15, No. 1-2, 191-6 (1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 2979).

Based on an estimate of articles published during the past five years in leading physical journals, the author determines the sphere of advantageous application of various accelerating devices. (auth)

7541

VAN-DE-GRAAFF GENERATOR WITH COMPRESSED-GAS INSULATION FOR A VOLTAGE UP TO 4 Mv. K. Simonyi. Acta Tech. Acad. Sci. Hung. 15, No. 1-2, 197-204(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 2981).

A description is given of the construction of two Van de Graaff generators, located in open air, and of measurements performed with these generators. A 1-Mv installation, operating in a compressed-gas atmosphere, is described. It served as a model for the construction of a 4-Mv generator. The construction of the generator and the diagram of the maximum voltages that can be obtained at various pressures are described. (auth)

7542

ON ELECTRON ACCELERATORS WITH PROGRESSIVE WAVE INCORPORATING THEIR HIGH FREQUENCY ENERGY SOURCE. René Warnecke, Henri Leboutet, and Germaine Vincent. Compt. rend. 246, 1399-1401(1958) Mar. 3. (In French)

A new design for an electron accelerator is presented. The novel characteristic of the accelerator is that the same delay circuit is utilized for the generation of high frequency energy and for the electron acceleration. (J.S.R.)

7543

A NOTE ON THE WIRE LOOP METHOD FOR LOCATING THE MEDIAN PLANE IN A CYCLOTRON MAGNET. Vatroslav Lopasic (Faculty of Tech., Zagreb). Glasnik Mat. Fiz. i Astron. 10, No. 5, 195-8(1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 2989).

Current-carrying wire loops, attached at one point to the float, are used extensively to investigate the equilibrium orbits in cyclotrons. The article indicates a method for finding the median plane of a magnet with the aid of such a loop. It is shown that the central point of the circle formed by the loop lies in the median plane, if the position of the float is independent of the current flowing through the loop. (auth)

7544

CERTAIN ADDENDA TO THE ARTICLE "ON THE PROBLEM OF FOCUSING A FLAT BEAM OF CHARGED PARTICLES BY A MAGNETIC FIELD THAT VARIES ALONG A SINGLE RECTANGULAR COORDINATE." V. R. Saulit (Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 374-6(1956). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 2998).

In a previous article a particular suggestion was made concerning expanding the function $f(\mu)$ into a series. In this addendum, the integral equation is solved under a more general assumption concerning the function $f(\mu)$. In addition, a general equation, not given previously, is now presented for finding the coefficients of the series expansion of $f^*(\mu)$. (auth)

7545

340 kev ACCELERATOR DESIGNED TO STUDY REACTIONS INDUCED BY TRITONS. D. Magnac-Valette, M. Suffert, M. Liess, and P. Cüer (Laboratoire de Physique Corpusculaire, Strasbourg). J. phys. radium 19, 88-91(1958) Jan. (In French)

An accelerator working with an electrostatic high tension is described. It is specially designed for triton acceleration. It gives a very well focused beam with a low gas consumption and a very high percentage of atomic ions. A special magnetic deflection is added to it that focuses the beam at 120° to the initial direction. Such an accelerator may work with a mixture of H^3 and H^1, at a weak concentration of H^3 as the very percentage of atomic ions makes the triatomic hydrogen beam so poor that it does not prevent the observation of triton induced reactions. (tr-auth)

7546

800 KV PARTICLE ACCELERATOR IN THE DEPARTMENT OF ATOMIC PHYSICS OF THE CENTRAL SCIENTIFIC INSTITUTE OF PHYSICS. Endre Pasztor and Janosne Siegler. Magyar Fiz. Folyoirat 3, No. 5-6, 497-513(1955). (Translated from Referat. Zhur. Fiz. No. 2, 1957, abstract no. 2982).

7547

ENERGY STABILIZATION OF THE BERKELEY PROTON LINEAR ACCELERATOR. H. B. Knowles (Univ. of California, Berkeley). Rev. Sci. Instr. 29, 130-6(1958) Feb.

A device is described which stabilizes the energy of the 32-Mev proton linear accelerator. The general system is similar to that developed for the Princeton cyclotron, with the exception of the control on the output energy. This control is obtained by slightly detuning the exit end of the r-f cavity by means of a rotating paddle. Range is used to predetermine the proton energy. An auxiliary circuit is provided for direct control of the correcting paddle. Two ionization-chamber currents are compared by a difference amplifier which is quite sensitive but very stable and can be located at any distance from the ionization chamber. An energy stabilization of ±40 kev is achieved. (auth)

7548

OBSERVATION OF THE DEFLECTED ION BEAM TRAJECTORY FROM A CYCLOTRON. Kiichi Kimura, Jun Kokame, and Sukeaki Yamashita (Kyoto Univ., Japan). Rev. Sci. Inst. 29, 142-3(1958) Feb.

A simple and convenient method has been employed to determine the trajectory of the deflected ion beam from a cyclotron. Using several mesh screens across the beam path, the location and angular divergence of the beam in various places can be obtained simultaneously by the holes made by the ion bombardment on these meshes. (auth)

7549

ENERGY DISTRIBUTION OF INCOHERENT RADIATION FROM SYNCHROTRON ELECTRONS. Iu. M. Ado and P. A. Cherenkov (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 517-19 (1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 1947.

7550

AN EXPERIMENTAL INVESTIGATION OF THE ANGULAR DISTRIBUTION AND POLARIZATION OF OPTICAL RADIATION FROM ELECTRONS IN A SYNCHROTRON. F. A. Korolev, V. S. Markov, E. M. Akimov, and O. F. Kulikov (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 1, 568-70(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3454.

7551
FUNCTIONS OF EQUATIONS FOR THE FREE OSCILLATIONS OF WEAKLY FOCUSING ACCELERATOR WITH CUT MAGNET AND THEIR USES. V. I. Kotov and N. B. Rubin. Zhur. Tekh. Fiz, 28, 365-79(1958) Feb. (In Russian)

An analytical expression was found for the eigenfunction of the equation for free (betatron) oscillations of weakly focusing accelerators with cut magnet. The effects of distorted vertical component of the magnetic field and the mean magnetic surface on the free oscillations in the absence of resonance were studied, as well as the character of the amplitude with a precise resonance level. The perturbations were expanded into a series of eigenfunctions. The same method was applied in studies of the parametric and linear resonance of the associated vertical and radial free oscillations in the magnetic field with diminishing exponents corresponding to the precise resonance level. (tr-auth)

Radiation Absorption and Scattering

7552 ER-9427
Martin Co., Baltimore.
AIRCRAFT STRUCTURE AND COMPONENT SCATTERING AND ACTIVATION. P. C. DeCelles, F. L. Jenkins, and J. B. Weddell. Feb. 1958. 39p.

An analytical model was developed so that the crew compartment dose rate in a nuclear powered aircraft, due to structural and component scattering and activation, could be calculated. The airframe and other aircraft components were represented by a series of coaxial cylindrical shells extending along the longitudinal axis of the fuselage. Each shell was assumed to be of a homogeneous composite material, the composition of which was based upon the mass distribution of chemical elements in the aircraft. Mathematical expressions, for quite general conditions applicable to the reactor emission and the structural materials, were derived for calculating dose components. These components are due to γ ray and neutron scattering, and γ rays emitted by activated materials. Attenuation and scattering of the radiation by air were also considered. Only single scattering was included in the shell model for the structure and components. (auth)

7553
THE EXCITATION OF THE 4.43 Mev LEVEL OF C^{12} BY PROTONS OF ABOUT 100 Mev. P. Benoist, C. Marty, and P. Meyer (Institut du Radium, Orsay et École Normale Supérieure, Paris). J. phys. radium 19, 11-12(1958) Jan. (In French)

The angular distribution of protons inelastically scattered by C^{12} with excitation of the 4.43 Mev level has been calculated, assuming for the reaction a direct interaction process, by the Born approximation and by taking into account the distortion of the incoming and outgoing proton waves by a complex potential. (tr-auth)

7554
ASYMMETRY IN THE ANGULAR DISTRIBUTION OF NEUTRONS INELASTICALLY SCATTERED AT 1 TO 5 Mev. D. Szteinsznaider, M. Roclawski-Conjeaud, and V. Naggir (C. E. N., Saclay, France) and G. C. Phillips (Rice Inst., Houston, Texas). J. phys. radium 19, 54-5(1958) Jan. (In French)

The inelastic scattering of neutrons at energy of a few Mev by I^{127} is asymmetric about 90°. This asymmetry and its slow variation with incident energy shows a contribution of direct interaction. (tr-auth)

7555
ELASTIC SCATTERING OF γ RAYS OF 1.12, 1.17, 1.33, AND 2.62 Mev. J. Banaigs, P. Eberhard, L. Goldzahl, and E. Hara (Collège de France). J. phys. radium 19, 70-2(1958) Jan. (In French)

Experimental and theoretical results are compared in order to show the Delbruck effect. The conclusion is negative for 1.12 and 1.33 Mev, but it is more difficult to give any conclusion for 2.62 Mev. For 1.17 Mev a possible intervention of the inelastic scattering is found. (tr-auth)

7556
RANGE OF 4.5-Mev α PARTICLES IN URANIUM, GOLD, ZIRCONIUM, AND SILICON. A. Garin and H. Faraggi (C. E. N., Saclay, France). J. phys. radium 19, 76-8 (1958) Jan. (In French)

Using uranium alloys of known concentration in uranium it is possible to measure the range of 4.5 Mev α particles in different elements. It was found Si = 5.2 ± 0.1 mg/cm², Zr = 11 ± 0.35 mg/cm², Au = 17 ± 0.4 mg/cm², and U = 19.2 ± 0.4 mg/cm². Comparison is made with previous values. It is shown that, within experimental errors, the additivity rule and the Bragg-Kleemann rule seem to be verified quite well. (tr-auth)

7557
ELASTIC SCATTERING OF 5.7 Mev PROTONS FROM Fe, Cr AND Ti. Michiya Kondo, Takashi Yamazaki, Atsutomo Toi, and Shotaro Yamabe (Osaka Univ.) and Ryuzo Nakasima (Osaka City Univ.). J. Phys. Soc. Japan 13, 231-3(1958) Mar.

Using 5.7 Mev protons from the cyclotron, the angular distributions of protons elastically scattered from Fe, Cr, and Ti were investigated by means of nuclear emulsion technique. The angular distributions of the elastically scattered protons by these nuclei were similar to that of Ni, that is, the differential cross sections in the ratio to those of the Rutherford scattering increase linearly at large angles. Some qualitative arguments are given about this characteristic feature of these nuclei, together with previously measured elements Ni and Zn. (auth)

7558
ANGULAR DISTRIBUTION OF PROTONS INELASTICALLY SCATTERED FROM Mg^{24}. Shotaro Yamabe (Osaka Univ.). J. Phys. Soc. Japan 13, 237-40(1958) Mar.

The angular distributions of protons inelastically scattered from Mg^{24} ($Q = -1.368$ Mev) were measured from 22.5 to 165° in the laboratory system at incident proton energies of 5.1 and 5.4 Mev. The 44-in. Osaka University cyclotron was used to provide a proton beam, and the scattered protons were detected by nuclear emulsion technique. Both distributions obtained show an asymmetry about the center of mass scattering angle $\theta = 90°$ and a strong dependence with the energy of primary protons. (auth)

7559
PRESSURE-FED LIQUID HYDROGEN TARGET. Raphael Littauer (Cornell Univ., Ithaca, N. Y.). Rev. Sci. Instr. 29, 178-9(1958) Feb.

The design and operation of a pressure-fed liquid hydrogen target for use in high-energy radiation experiments. (A.C.)

7560
POLARIZATION OF LOW-ENERGY PROTONS SCATTERED BY CARBON. B. V. Gavrilovskii, V. Ia. Golovnia, K. V. Karadzhev, A. P. Kliucharev, and V. I. Man'ko (Physico-Tech. Inst., Academy of Sciences, Ukrainian SSR). Soviet Phys. (Doklady) 1, 611-14(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4145.

7561
THE POLARIZATION OF PROTONS SCATTERED ELASTICALLY BY C^{12}. P. V. Sorokin and A. Ia. Taranov (Physico-Tech. Inst., Academy of Sciences, Ukrainian, SSR). Soviet Phys. (Doklady) 1, 637-9(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstracts No. 4147.

7562
ON THE DISPERSION RELATION FOR NUCLEON-NUCLEON SCATTERING. F. M. Kuni (Leningrad State Univ.). Soviet Phys. (Doklady) 1, 686-9(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4148.

7563
ON AN INTERMEDIATE SYSTEM FORMED DURING THE SCATTERING OF ELEMENTARY PARTICLES. M. S. Livshits (Odessa Hydrometeorological Inst.). Soviet Phys. (Doklady) 1, 712-15(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4149.

7564
ELASTIC SCATTERING OF GAMMA RAYS WITH ENERGY TO 120 Mev BY PROTONS. B. B. Govorkov, V. I. Gol'danskii, O. A. Karpukhin, A. V. Kutsenko, and V. V. Pavlovskaia (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 735-8(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 6135.

7565
REFLECTION OF GAMMA-RAYS FROM BENT QUARTZ PLATES. O. I. Sumbaev (All-Union Scientific Research Inst. of Metrology). Soviet Phys. JETP 5, 1042-4(1957) Dec. 15.

The wavelength dependence of the coefficient of reflection from the 1340 planes of quartz crystal bent to a cylinder having a 2 meter radius was investigated on a two-meter crystal gamma-spectrometer. The quadratic character of this dependence was substantiated. It was shown that in theoretical examinations of this effect it is essential to take into account distortion of the reflecting planes. In the treatment, the plate is subdivided in thickness into a series of independently reflecting laminae, the thickness of which is less than the primary extinction distance. The crystal plate is found to behave as a mosaic crystal with small primary extinction. Thus the hitherto inexplicable quadratic dependence of the reflection coefficient on the wavelength finds a natural explanation. (auth)

7566
ANGULAR AND ENERGY DISTRIBUTIONS OF PHOTOPROTONS FROM Be^9 AND C^{12}. I. V. Chuvilo and V. G. Shevchenko (P. N. Lebedev Physical Inst., Academy of Sciences, USSR). Soviet Phys. JETP 5, 1090-3(1957) Dec. 15.

Results of measurements of the angular and energy distributions of protons produced in the photodisintegration of Be^9 and C^{12} are presented. The gamma-ray source was a 265-Mev electron synchrotron. The protons were recorded on photographic plates. Analysis of the results leads to the conclusion that in the 60 to 80 Mev range the gamma rays interact mainly with separate structures produced within the nuclei. (auth)

7567
THEORY OF DIFFUSE SCATTERING OF X-RAYS AND THERMAL NEUTRONS IN SOLID SOLUTIONS. II. MICROSCOPIC THEORY. M. A. Krivoglaz (Inst. of Metal Physics of the Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 5, 1115-25(1957) Dec. 15.

Diffuse scattering of x rays and thermal neutrons by composition and order fluctuations in solid solutions is considered. For disordered solutions and ordered solutions of AB stoichiometric composition the calculations have been carried out taking into account interaction between atoms lying in coordinative spheres separated by arbitrarily large distances. A method is indicated for the determination of the ordering energy for various coordinative spheres from the experimental distribution of the background intensity. Anomalously high diffuse scattering near points of phase transition of the second order and near critical points on the decay curve is considered. (auth)

7568
ELECTRON-POSITRON PAIR PRODUCTION IN COLLISIONS BETWEEN FAST π-MESONS AND NUCLEONS. E. M. Rabinovich. Soviet Phys. JETP 5, 1272-5(1957) Dec. 15.

The cross section is calculated for pair production in collisions between high-energy π-mesons and nucleons. (auth)

7569
SCATTERING OF PHOTONS BY PROTONS. A. M. Baldin and V. A. Petrun'kin. Soviet Phys. JETP 5, 1279-81(1957) Dec. 15.

In connection with experimental investigation of scattering of photons by photons it is of interest to examine this process, starting from the general properties of the S-matrix and elementary physical considerations. The purpose of the present effort is to obtain information on the structure of the S-matrix and the minimum number of parameters necessary for describing the process in question. (A.C.)

7570
CALCULATION OF THE POLARIZATION OF NEUTRONS ON THE BASIS OF THE DIFFUSED EDGE NUCLEAR MODEL. P. E. Nemirovskii and Iu. P. Elagin (Academy of Sciences, USSR). Soviet Phys. JETP 5, 1293-4(1957) Dec. 15.

Radiation Effects

7571 CRNE-744
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
REPORT ON THE FIRST NPD-1 SINGLE ELEMENT IRRADIATION AND FAILURE. J. Howieson. Aug. 1957. 89p. (AECL-552). $2.00(AECL).

An NPD fuel rod was intended to consist of a bundle of 19 elements each 0.504 in. UO_2 diameter, clad in 0.027 in. Zircaloy-2, and 8 ft 9 in. long. This first test was of a single one of these elements under conditions approximating the most severe to be encountered in the reactor. The test was carried out in the E-9 rod position of the NRX Reactor. The heat was removed from the element by high pressure, high pressure water circulated in the loop system. The irradiation started on January 18 and proceeded as planned. On February 26 a hole appeared through the sheath. One of the series of tests called for the operation of a defected rod to observe the activity released in normal operation. The power was lowered to 5 Mw and then raised back to 40 Mw. This caused all the monitors to go off scale. The reactor was shut down and the element removed for examination. It was found that the Zircaloy-2 cladding had corroded and in one place at the center of the rod had corroded completely through and exposed fuel. (W.L.H.)

7572 NP-6626
Naval Research Lab., Washington, D. C.
INVESTIGATION OF CERAMIC BONDED NICHROME V FOIL GAGES IN THE LOW INTENSITY TESTING REACTOR. Robert C. Smith. July 24, 1956. 13p. (NRL-6252-244A/56).

7573 NP-6627
Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.
ACCESSION LIST NO. 8 [ON RADIATION EFFECTS DATA]. Feb. 15, 1958. 51p. Project No. 2133. Contract AF33(616)-5171.

7574 NP-6638
Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.
ACCESSION LIST NO. 9 [ON RADIATION EFFECTS DATA]. Mar. 15, 1958. 40p. Project No. 2133. Contract AF33 (616)-5171.

7575 OMRO-13A
Watertown Arsenal. Ordnance Materials Research Office, Mass.
REPORT OF CONFERENCE ON EFFECTS OF NUCLEAR RADIATIONS ON MATERIALS SPONSORED BY ORDNANCE MATERIALS RESEARCH OFFICE AT WATERTOWN ARSENAL, OCTOBER 1 AND 2, 1957. Feb. 1958. 88p.

The agenda, abstracts, and some of the papers presented at the second Ordnance Corps Conference on Nuclear Energy Applications are presented. The reports were "Analysis of Activated Spectroscopic Copper," "Analysis of Activated Blast Gage Components," "The Effect of Nuclear Radiation on Lubricants," "High Energy Radiation in the Field of Plastics," "The Effects of X Radiation on the Optical Properties of Quartz Crystals," and "Gamma-Ray Induced Coloring of Potassium Azide." (J.S.R.)

7576
NUCLEAR QUADRUPOLE RESONANCE OF NEUTRON-IRRADIATED SODIUM CHLORATE. Joseph Depireux and Jules Duchesne (University of Liège). Nature 181, 759 (1958) Mar. 15.

7577
ELECTRON BOMBARDMENT OF COUNTING DIAMONDS. G. W. Dolphin (St. Bartholomew's Hospital Medical Coll., London) and Kathleen Stratton (Royal Free Hospital School of Medicine, London). Proc. Roy. Soc. (London) A244, 424-36(1958) Mar. 25.

The effect of 13.5 Mev electron bombardment on the response of diamonds as conduction counters for α or β radiation has been investigated. The counting pulse heights decrease progressively with increasing electron bombardment flux until after a total flux of 4×10^{16} electrons/cm^2 they are barely detectable. Both counting and non-counting diamonds also become perceptibly bluish green after bombardment fluxes of this order. The collision model of damage gives a satisfactory interpretation of the general effects of bombardment, and differences between the intrinsic textural defects and those induced by bombardment can be attributed to the presence of interstitial carbon atoms after damage. However, the initial rapid decrease in pulse heights requires an additional disordering mechanism, and it is suggested that preferential damage in the vicinity of intrinsic aggregates of vacant sites may lead to partial graphitization of such regions. (auth)

Radioactivity

7578 USNRDL-TR-208
Naval Radiological Defense Lab., San Francisco.
THE NATURE OF INDIVIDUAL RADIOACTIVE PARTICLES. VI. FALLOUT PARTICLES FROM A TOWER SHOT, OPERATION REDWING. C. E. Adams and J. D. O'Connor. Dec. 2, 1957. 19p.

Studies were made of the structure and composition of, and the distribution of radioactivity within, the fallout particles resulting from a tower shot in Operation REDWING. Techniques utilizing the petrographic microscope and x-ray-diffraction analysis were employed. Three types of fallout particle were found. The most common type was formed by the interaction of the vaporized iron and radioactive elements with molten calcium oxide derived from the coral sand which was carried up into the fireball by atmospheric turbulence. These particles consisted of an outer zone of radioactive dicalcium ferrite surrounding an inactive residual core of altered calcium oxide. The second type consisted almost wholly of radioactive iron oxide and apparently was formed by the melting and oxidation of part of the steel tower. The third type consisted of unmelted coral sand grains which had small, black, radioactive spheres adhering to their surfaces. (auth)

7579
ON THE RADIATION OF Po^{210}. Marie Ader. Compt. rend. 246, 97-8(1958) Jan. 6.

An artificial Po source emits ionizing particles with long trajectories and neutrons whose spectra are identical to spectra of radiation emitted from sources of natural Po. (tr-auth)

7580
LONGITUDINAL POLARIZATION OF β RAYS. STUDY OF Sr^{90} AND S^{35}. Langevin-Joliot and N. Marty (Collège de France, Orsay). J. phys. radium 19, 28-31(1958) Jan. (In Franch)

The apparatus used to study the polarization of the electrons from Sr^{90}(ΔJ = 2 yes) and S^{35}(ΔJ = 0 no) is described. Considering the thickness of source and scatterer, the results agree with a negative polarization equal to v/c. (tr-auth)

7581
ASYMMETRY OF THE POSITON EMISSION FROM POLARIZED ^{58}Co AND ^{52}Mn NUCLEI. H. Postma, W. J. Huiskamp, A. R. Miedema, M. J. Steenland, H. A. Tolhoek, and C. J. Gorter (Kamerlingh Onnes Lab., Leiden). Physica 24, 157-68(1958) Mar.

A method for measuring the asymmetry of positron emission by studying its annihilation radiation is described and discussed. If the directional distribution of the positrons from Co^{58} is written as $W(\vartheta) = 1 + f_1\beta \cos\vartheta$ with $f_1 = \langle I_z \rangle / I$, the experimental result can be given as $\beta = (0.24 \pm 0.05)$ (v/c). Four different interpretations of this result are discussed. The asymmetry for Mn^{52} is zero within the experimental error. It follows that the nuclear spin of Mn^{52} is 6. (auth)

7582
TRIPLE COINCIDENCE MEASUREMENTS IN THE DECAY OF ^{48}V. B. Van Nooijen, J. Konijn, and A. H. Wapstra (Laboratorium voor technische Fysica, Technische Hogeschool, Delft, Netherlands). Physica 24, 231-2(1958) Mar.

7583
THE SEARCH FOR DOUBLE BETA DECAY IN Ca^{48}. E. I. Dobrokhotov, V. R. Lazarenko, and S. Iu. Luk'ianov. Soviet Phys. (Doklady) 1, 600-3(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3601.

7584
POLARIZATION OF ELECTRONS IN β-DECAY. A. I. Alikhanov, G. P. Eliseev, V. A. Liubimov, and B. V. Ershler. Soviet Phys. JETP 5, 1097-1101(1957) Dec. 15.

Experiments have been made to test the law of conservation of parity by observing the longitudinal polarization of electrons in β decay. It is found that the β electrons have their spin directed opposite to their direction of motion. The degree of longitudinal polarization is equal to (v/c). (auth)

7585
EXCITATION OF ROTATIONAL STATES IN α-DECAY OF EVEN-EVEN NUCLEI. V. M. Strutinskii. Soviet Phys. JETP 5, 1150-7(1957) Dec. 15.

The relative probability of excitation of rotational states in the α decay of deformed even-even nuclei is computed. The deformation parameter of the nucleus is determined by comparison with the probability for transition to the 2 + state. The values of the deformation parameter and relative probability of transition to a 4 + rotational state obtained in this way are compared with the experimental data. (auth)

7586
CONCERNING ONE METHOD OF MEASURING THE LIFE-TIMES OF EXCITED STATES OF ATOMIC NUCLEI. A. F. Tulinov (Moscow State Univ.). Soviet Phys. JETP 5, 1277-9(1957) Dec. 15.

7587
BETA-EMISSION FROM POLARIZED NUCLEI. G. R. Khutsishvili (Inst. of Physics, Academy of Sciences, Georgian SSR). Soviet Phys. JETP 5, 1288-91(1957) Dec. 15.

7588
THE MEASUREMENT OF THE ANGULAR CORRELATION IN THE γ SPECTRUM OF Tm^{169}. U. Cappeller and R. Klingelhöfer. Z. Physik 150, 375-88(1958). (In German)

The energy and angular momentum suggested for the decay scheme of Tm^{169} is based almost entirely on the measurement of the γ-γ coincidence spectrum, the conversion electron spectrum, and the evaluation of the conversion coefficient. To prove the decay scheme the angular correlations of the 199/110 kev cascade and the 178/131 kev cascade were measured with two single channel scintillation spectrometers placed in coincidence. The results of the measurements confirmed the proposed angular momentum and multipole assignments and yielded an expression for the mixed character of the investigated γ lines. (tr-auth)

Rare Earths and Rare-earth Compounds

7589
EXCITATION OF ARC AND SPARK SPECTRA OF GADOLINIUM, DYSPROSIUM, ERBIUM, AND THULIUM IN THE ALTERNATING-CURRENT ARC. A. I. Akimov (Lomonosov Moscow State Univ.). Optika i Spektroscopiya 3, 545-51 (1957) Dec. (In Russian)

A method based on the evaporation of a fine film from the surface of a carbon electrode is offered for the determination of the arc and spark spectra of some rare earths. (tr-auth)

7590
HYPERFINE STRUCTURE AND IDENTIFICATION OF SOME PRASEODYMIUM LINES. V. B. Belyanin (Moscow State Univ.). Optika i Spektroscopiya 4, 264-6(1958) Feb. (In Russian)

The hyperfine structure of the spectral lines of Pr I and Pr II have been measured, and additional data were developed for Pr II. The Pr hyperfine structure lines consist of 6 diagonal intensity components with the intensities and intervals falling in some cases into the red and in other cases into the violet region of the spectra. The prints did not uncover any nondiagonal (weak) components. Tables presenting the numerical results of measurements made of Pr II and Pr I lines are included. (R.V.J.)

7591
ON THE ISOTOPE SHIFT IN THE SPECTRUM OF NEODYMIUM. F. A. Korolev and Iu. I. Osipov (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 1, 549-51(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3212.

7592
GADOLINIUM ISOTOPE WITH MASS 146. I. A. Gusev, O. M. Lilova, A. N. Murin, B. K. Preobrazhenskii, and V. A. Iakovlev (Radium Inst., Academy of Sciences, USSR). Soviet Phys. JETP 5, 1295-6(1957) Dec. 15.

When tantalum is bombarded with 660-Mev protons, new Gd isotopes are formed which have been hitherto unreported. In fractions of Eu separated from pure fractions of Gd a radioisotope was observed that decays with a period of 1.6 days in accord with data for Eu^{146}. The period of the parent substance, Gd^{146}, was determined to be 12 ± 4 hours. (A.C.)

Shielding

7593 AECU-3655
Kaiser Engineers Div., Henry J. Kaiser Co., Oakland, Calif.
DESIGN AND CONSTRUCTION OF THE HIGH DENSITY CONCRETE SHIELDING FOR THE ENGINEERING TEST REACTOR. E. A. Dukleth, J. M. Raphael, B. Wedell, P. D. Bush, and A. P. Donaldson. May 15, 1957. 57p. Contract AT(10-1)-770. $9.30(ph OTS); $3.60(mf OTS).

Economic studies showed that high-density concrete made with magnetite was the most feasible choice from a cost and construction standpoint. Except for a few precautions, this concrete can be placed in essentially the same manner as conventional concrete. Concrete of any strength can be made, within reason, but for concretes having strengths of less than 4,000 psi at 28 days, extra fines must be added to the mix to lend supporting power and lubricity to the paste. Modulus of elasticity and Poisson's ratio for this dense concrete are approximately 50% higher than for normal-weight concretes of the same compressive strength. (A.C.)

7594 CF-5213
Gt. Brit. Dept. of Atomic Energy. Industrial Group H. Q., Risley, Lancs, England.
ANALYSIS OF THE COOLING OF THE THERMAL REACTOR SHIELD. R. A. Pearse. Apr. 22, 1954. 36p. (TRDC-P-32).

The shield of the Thermal Reactor is heated by nuclear radiation and by heat transfer from the pressure vessel. Atmospheric air can be effectively used as a coolant. This note examines such an air cooling system in which the total air requirement is 84,400 C.F.M. (auth)

Spectroscopy

7595
OPTICAL DETECTION OF HYPERFINE TRANSITIONS OF CESIUM ATOMS. Felix Diamond, Jean-Marc Legendre, and Tadeusz Skalinski. Compt. rend. 246, 90-2(1958) Jan. 6.

7596
A MODULATION METHOD FOR NUCLEAR RESONANCE SPECTROSCOPY WITH HIGH RESOLUTION. H. Primas (Organisch-chemisches Laboratorium der Eidg. Technischen Hochschule, Zurich). Helv. Phys. Acta 31, No. 1, 17-24(1958). (In German)

A side band modulation method is discussed which permits the direct registration of absorption of dispersion signals and which is especially designed for high resolution nuclear resonance spectroscopy. This modulation method allows the elimination of noise at very low frequencies and gives an absolute zero point, which permits the use of electron integration for structure clarification of molecules. The Bloch equations were solved generally for

arbitrary modulation amplitudes of the B_0 field and for arbitrary magnitude of the B_1 field. The optimal dimensions for the modulation method are discussed. A comparison with statistical methods gives a simple correction of the signal noise proportion for white sound. (tr-auth)

7597

HYPERFINE STRUCTURE OF SPECTRAL LINES AND OF SPINS OF NUCLEI U^{233} AND Pu^{238}. L. A. Korostyleva, A. R. Skriganov, and N. M. Yashin. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 19, No. 1, 31-4(1955). (Translated from Referat. Zhur. Fiz. No. 3, 1957, abstract No. 7808)

7598

ADVANTAGES OF A SPECTROMETER OF THE MILEIKOWSKY TYPE WITH NON STIGMATIC FOCUSING TO DETERMINE THE ENERGY BALANCE OF LIGHT NUCLEI REACTIONS. L. Bianchi and E. Cotton (C. E. N., Saclay, France). J. phys. radium 19, 92-3(1958) Jan. (In French)

For light nuclei reactions, the emitted particle energy depends appreciably on the angle of emission; with a double focusing spectrometer using a large entrance angle, this variation can be of several %. Experiments tested for the first time this improvement of energy resolution with astigmatic system (n = 0.57) and with a variable tilting angle of exit slit (after suggestions of Curt Mileikowsky). (tr-auth)

7599

A NEW PRINCIPLE OF SPECTROMETRY. N. G. Bakhshiyev. Optika i Spektroskopiya 2, No. 6, 816-18 (1957).

Narrow spectral regions are normally separated out by means of dispersion (prisms or diffraction gratings). In both cases spatial separation of beams of various wavelengths is obtained. This note proposes a new method which combines monochromatization and recording of spectra into one process without using either prisms or diffraction gratings. The method is based on amplitude modulation of light. The modulation frequencies are a monotonic function of the wavelength of light in the whole spectral region studied. The receiving and amplifying apparatus performs two functions at the same time: recording and monochromatization. The proposed apparatus (an actual spectrometer using this principle has not yet been constructed) is shown. It consists of two lenses and a modulator M. This modulator is shown in great detail. It consists of two polarizers whose main cross sections are parallel and at an angle of 45° to the optical axis. (TCO)

7600

A VACUUM SPECTROMETER WITH A DIFFRACTION GRATING FOR THE 0.7-3μ SPECTRAL REGION. B. S. Neporent, K. P. Vasilevskiy, N. A. Lapina, and V. A. Fursenkov. Optika i Spektroskopiya 3, No. 3, 289-93(1957).

An apparatus of high resolving power for obtaining spectra in the 0.7 to 3 μ region is described. It consists of a recording vacuum spectrometer with a diffraction grating and a cell in which a path length of 180 m can be obtained for the light. The instrument records spectra of rarefied or weakly absorbing gases at temperatures from room temperature to 100°C. The absorption spectrum of water vapor was recorded at 2.7 μ. The absorption and emission spectra of carbon dioxide can be measured if a quartz container is used. (J.S.R.)

7601

TRIPLET-QUINTET TRANSITIONS IN THE ATOMIC SPECTRUM OF SILICON. N. A. El'iashevich and O. N. Nikitina (Physics and Mathematics Inst., Academy of Sciences, Byelorussian SSR Inst. for Silicate Chemistry, Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 649-51(1956) Nov. Dec.

In the investigation of the silicon spectrum excited in a d-c carbon arc through the burning of SiO_2 out of the anode, two weak spectral lines were detected at 3006.72 A and 3020.00 A. It was carefully verified that these lines belong to the silicon spectrum. From relative intensity measurements with the lines 2970.35 A and 2577.13 A and from excitation energies, the lines at 3020.00 and 3006.72 A are assigned. (J.S.R.)

7602

ISOTOPIC ANALYSIS OF LITHIUM BY OPTICAL SPECTROSCOPY. I. USE OF 4603A λ. J. Artaud, J. Blaise, and S. Gerstenkorn (Centre d'Études Nucléaires, Saclay and Laboratorie Aime Cotton-Centre National de la Recherche Scientifique, Bellevue, France). Spectrochim. Acta 10, 118-18(1957) Nov. (In French)

An interferometric isotopic assay for lithium with the line λ = 4603 (2P – 4D) is described. The light source is a liquid nitrogen-cooled hollow cathode working under low current. Excited in this way, the line λ = 4603 does not show any self absorption, unlike the red line λ = 6707.8 A. It is shown that the Doppler width is different for both isotopes of lithium. The value of the natural abundance ratio of lithium isotopes is found to be 12.3 ± 0.3. (auth)

Theoretical Physics

7603 NEVIS-49

Columbia Univ., Irvington-on-Hudson, N. Y. Nevis Cyclotron Labs.

WEAK INTERACTIONS. T. D. Lee. June 1957. 17p. Contracts N6-ori-110-Task No. 1 and AT(30-1)-1932. (CU-144-57-ONR-110-1-Phys.) $3.30(ph OTS); $2.40 (mf OTS).

Experimental results on the non-conservation of parity and charge conservation in weak interactions are reviewed. The two-component theory of the neutrino is discussed. Lepton reactions are examined under the assumption of the law of conservation of leptons and that the neutrino is described by a two-component theory. From the results of this examination, the universal Fermi interactions are analyzed. Although reactions involving the neutrino can be described, the same is not true of reactions which do not involve the lepton, as the discussion of the decay of K mesons and hyperons shows. The question of the invariance of time reversal is next examined. (J.S.R.)

7604

CROSS SECTIONS FOR ELECTROSTATIC INTERACTIONS IN PLASMA. Michel Bayet. Compt. rend. 245, 2493-6 (1957) Dec. 23. (In French)

The different effective cross sections for particles of mass m described by the distribution function $f(\vec{r},\vec{t})$ are calculated for the case of a plasma. (tr-auth)

7605

ON THE NEUTRINO FIELD WITH TWO COMPONENTS. Takehiko Takabayasi. Compt. rend. 246, 1010-13(1958) Feb. 17. (In French)

The structure of the field of the neutrino with two components was studied from a new point of view, leading to the manifestation of new symmetric properties and to new conservation laws of the field. (tr-auth)

7606

NEUTRAL SCALAR MESON-NUCLEON ADIABATIC INTERACTION. Jacqueline Feldman. Compt. rend. 246, 1163-5 (1958) Feb. 24. (In French)

7607

THEORETICAL PROBLEM CAUSED BY AN EXPANDED MODEL OF THE ELECTRON AND PROTON. Ernest Joachim Sternglass. Compt. rend. 246, 1386-9(1958) Mar. 3. (In French)

The arguments concerning the stability and the relativistic properties of elementary particles as expanded sources of electromagnetic fields are considered. (tr-auth)

7608

THE PRODUCTION AND ABSORPTION OF NEUTRINOS IN BETA-DECAY THEORY. Charles P. Enz (Swiss Federal Inst. of Tech., Zürich). Helv. Phys. Acta 31, No. 1, 69-88 (1958).

The implications of non-conservation of parity and of lepton charge for the processes (1) $(A, Z-1) \rightarrow (A, Z) + e^- + \nu$ and (2) $p + \nu \rightarrow n + e^+$ are studied. The neutrinos from (1) are described by a density matrix which, in a form applicable to pile neutrinos, is used, in particular, to calculate the cross section $\bar{\sigma}$ for reaction (2). From the general dependence of $\bar{\sigma}$ on the coupling constants the result of Lee and Yang, that $\bar{\sigma}$ is twice as big in the two-component theory as in the conventional theory, is recognized as a special case. In addition experiments are discussed to determine the spectrum and polarization of pile neutrinos. Attention is also given to Pauli's invariance principle. (auth)

7609

THE ASYMMETRY OF WEAK INTERACTIONS. Roger Nataf (Collège de France, Orsay). J. phys. radium 19, 18-27(1958) Jan. (In French)

By use of examples from classical mechanics and electrodynamics, the definitions of invariance by space symmetry of "intrinsic parity" and orbital parity are derived. Then, in quantum mechanics, the possibilities of intrinsic parities are discussed for 0 and $\frac{1}{2}$ spin particles with non-vanishing and vanishing (neutrino) rest mass. The Weyl (two component) theory of the neutrino is given. The quantum field treatment of emission and absorption processes is shown, and the total parity conservation theorem is given for P (spatial symmetry) invariant interactions. The experiments of C. S. Wu et al., and of Barwin et al., and of Garwin et al., suggested by the Lee-Yang theory are described. In conclusion, experiments show the P and C (charge conjugation) non-invariance in weak interactions. The Luders-Pauli theorem is mentioned, and the Landau hypothesis of PC invariance is given. (tr-auth)

7610

REMARKS ON ACTUAL KNOWLEDGE OF β INTERACTION. R. Nataf (Collège de France, Orsay). J. phys. radium 19, 32-3(1958) Jan. (In French)

It is shown that a VAST interaction, where ST is associated with a "right-handed" neutrino and VA with a "left-handed" one, which leads to the maximum longitudinal polarization of β particles, agrees with all the present conclusive experimental evidence on β decay of nuclei. (tr-auth)

7611

SPIN-HAMILTONIAN OF INTERACTION OF THE LOCALIZED ELECTRON IN A CRYSTAL WITH MAGNETIC MOMENTS OF NUCLEI. V. Ya. Zevin. Optika i Spektroscopiya 3, 660-4(1957) Dec. (In Russian)

7612

EXACTLY RENORMALIZABLE MODEL IN QUANTUM FIELD THEORY. I. THE DIAGRAM ANALYSIS. Th. W. Ruijgrok (Instituut voor theoretische fysica der Rijksuniversiteit, Utrecht). Physica 24, 185-204(1958) Mar.

A simple model is considered for the interaction of a boson field with infinitely heavy nucleons, susceptible of an exact determination of the physical nucleon states and of the renormalization constants. The model is an extension of the Lee model as well as of the neutral scalar field in scalar interaction with heavy nucleons. The diagram analysis of the S-matrix and of the renormalization is carried out. The renormalized coupling constants remain different from zero for infinite cut-off. In this limit the theory becomes essentially equivalent to the neutral scalar field in interaction with heavy nucleons; it then gives vanishing boson-nucleon scattering but non-vanishing nucleon-nucleon interaction, the latter in contrast to the Lee model. (auth)

7613

EXACTLY RENORMALIZABLE MODEL IN QUANTUM FIELD THEORY. II. THE PHYSICAL-PARTICLE REPRESENTATION. Th. W. Ruijgrok (Instituut voor theoretische fysica, Rijksuniversiteit, Utrecht). Physica 24, 205-13(1958) Mar.

For the simplified model of quantum field theory discussed in a previous paper it is shown how the physical particles can be properly described by means of the so-called asymptotically stationary (a.s.) states. It is possible by formulating the theory in terms of these a.s. states to express it entirely in terms of renormalized quantities and convergent integrals. (auth)

7614

PSEUDOSCALAR INTERACTION IN NONLINEAR MESON THEORY. A. Borgardt (Dnepropetrovsk State Univ.). Soviet Phys. (Doklady) 1, 524-6(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 2032.

7615

ON THE DEPARTURE FROM WEAK COUPLING IN THE DOUBLY CHARGED MESON FIELD THEORY. I. F. Ginzburg (M. V. Lomonosov Moscow State Univ.). Soviet Phys. (Doklady) 1, 560-4(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3499.

7616

THE POTENTIAL IN PAIR THEORIES OF NUCLEAR FORCES. Iu. M. Lomsadze (Uzhgorod State Univ.). Soviet Phys. (Doklady) 1, 571-5(1956) Sept.-Oct.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 3623.

7617

THE ENERGY SPECTRUM OF He^3 DISSOLVED IN He II. N. G. Berezniak and B. N. Esel'son (Physico-Tech. Inst., Academy of Sciences, Ukrainian SSR). Soviet Phys. (Doklady) 1, 645-8(1956) Nov.-Dec.

It has been shown that an experimental study of the temperature dependence of the contribution of the impurity to the density of the normal component of He II allows the form of the energy spectrum to be established uniquely. For this purpose the density of the normal component of a solution of He^3 in He^4 with a 3.0% concentration of He^3 was measured. The temperature dependence of the normal component density was also measured. The effective mass of He^3 was calculated to be 2.5 m_3 in good agreement with previous results. Conclusions regarding the character of the energy spectrum agree with conclusions derived from measurements of the velocity of second sound in solution of helium isotopes. (J.S.R.)

7618

THE λ POINT OF SOLUTIONS OF HELIUM ISOTOPES. B. N. Esel'son, N. G. Berezniak, and M. I. Kaganov (Physico-Tech. Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 683-5(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4189.

7619

NUCLEON PROPAGATION FUNCTION IN THE QUADRATIC APPROXIMATION. V. G. Solov'ev (Inst. for Nuclear Problems, Academy of Sciences, USSR). Soviet Phys. (Doklady) 1, 693-7(1956) Nov.-Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 11, as abstract No. 4017.

7620
OPTICAL MODEL OF THE INTERACTION OF NUCLEONS WITH NUCLEI IN THE RESONANCE REGION OF THE COMPOUND NUCLEUS. V. M. Agranovich and A. S. Davydov. Soviet Phys. JETP 5, 1164-9(1957) Dec. 15.

A study is made of the energy dependence of the real and imaginary parts of the effective potential of the optical model, with all states of the compound nucleus taken into account. An interpretation is given of the broad resonances in the interaction of neutrons with nuclei. (auth)

7621
CONTRIBUTION TO THE THEORY OF EXCHANGE COLLISIONS BETWEEN FAST NUCLEONS AND DEUTERONS. L. I. Lapidus (Joint Inst. for Nuclear Research). Soviet Phys. JETP 5, 1170-4(1957) Dec. 15.

It is shown that, under some general assumptions regarding the nucleon-nucleon scattering amplitude, comparison of the experimental data on exchange scattering of fast nucleons by deuterons with the results of computations carried out in the impulse approximation can be of aid in the phase shift analysis of scattering of neutrons by protons. The phase-shift analysis carried out by Klein does not agree with the experimental data on the exchange scattering. (auth)

7622
THE STRUCTURE OF SHOCK WAVES IN A PLASMA. V. D. Shafranov (Academy of Sciences, USSR). Soviet Phys. JETP 5, 1183-8(1957) Dec. 15.

The structure of shock waves in a plasma is investigated, taking account of the difference between the electron and the ion temperatures. The following cases are considered: a) no stationary shock wave in which the exchange of energy between electrons and ions may be neglected; b) stationary shock wave in a strong magnetic field. (auth)

7623
ON THE RARITA-SCHWINGER METHOD IN THE THEORY OF PARTICLES OF HALF-INTEGRAL SPIN. E. E. Fradkin (Leningrad State Pedagogical Inst.). Soviet Phys. JETP 5, 1203-5(1957) Dec. 15.

The possibility of generalizing the Rarita–Schwinger method of setting up the Lagrangian for particles with large spins ($s > \frac{3}{2}$) is examined. It is shown that the result obtained by Moldauer and Case is valid only for particles of spin $\frac{3}{2}$. (auth)

7624
ON THE STATISTICAL INTERPRETATION OF QUANTUM THEORY. R. L. Stratonovich (Moscow State Univ.). Soviet Phys. JETP 5, 1206-16(1957) Dec. 15.

Various principles of operator arrangements as basis for a statistical interpretation are considered. An extremely concise expression for the distribution of trajectories in functional space is obtained, using the action functional, for the case of the ground state. The bichronological arrangement in time is a Markov process, and a continuous distribution density is found for it. (auth)

7625
VACUUM POLARIZATION IN MESONIC ATOMS. G. E. Pustovalov (Moscow State Univ.). Soviet Phys. JETP 5, 1234-42(1957) Dec. 15.

Level shifts in mesonic atoms due to vacuum polarization produced by the nuclear electric field are computed. The recursion relations between the meson wave functions are used to derive equations in closed form for the first six level shifts. The shifts for the first three levels of heavy mesonic atoms are computed with allowance for the finite volume of the nucleus. (auth)

7626
ANGULAR OPERATORS FOR NUCLEAR REACTIONS. V. I. Ritus (P. N. Lebedev Physical Inst., Academy of Sciences, USSR). Soviet Phys. JETP 5, 1249-58(1957) Dec. 15.

An orthogonal and normalized system of invariant angular operators is found; these are matrices in terms of which the scattering amplitude can be expressed. The angular operators correspond to transitions with definite total angular momentum and parity, and also definite values of other quantum numbers in the initial and final states, and they completely determine the angular distributions and polarizations of the particles in these transitions. The explicit form of the operators is presented for reactions in which the spin of the system is 0, $\frac{1}{2}$, and 1, and for analogous reactions with γ quanta, in particular for the scattering and energy loss of mesons against nucleons, for the scattering of photons and nucleons by nucleons, and for the reactions $N + N \rightarrow \pi + D$, $\gamma + D \rightarrow p + n$, and $\gamma + D \rightarrow \pi + D$. (auth)

7627
UNITARITY RELATIONSHIPS FOR ELASTIC COLLISIONS OF PARTICLES WITH ARBITRARY SPINS. R. M. Ryndin and Ia. A. Smorodinskii (Joint Inst. for Nuclear Studies). Soviet Phys. JETP 5, 1294-5(1957) Dec. 15.

7628
SOME REMARKS ON SLOW PROCESSES OF TRANSFORMATION OF ELEMENTARY PARTICLES. L. Okun' and B. Pontecorvo (Joint Inst. for Nuclear Research). Soviet Phys. JETP 5, 1297-9(1957) Dec. 15.

7629
QUESTION OF TIME REVERSAL INVARIANCE IN STRONG INTERACTIONS. Peter Stichel. Z. Physik 150, 264-71(1958). (In German)

The investigation of the specific asymmetry effect in the measurement of the linear polarization of γ radiation or γ–γ angular correlation from polarized nuclei produces an expression for invariance of strong interactions in contrast with time reversal. (tr-auth)

Tracer Applications

7630
USE OF RADIO-ACTIVE ISOTOPES FOR INVESTIGATING THE MECHANISM OF THE "PASSIVATION" OF CATHODE IN A MAGNESIUM ELECTROLYSER. Kh. L. Strelets and K. D. Muzhzhavlev. Tsvetnye Metal. No. 6, 52-6(1957).

It was suggested that the main cause of the passivation of cathodes in magnesium electrolyzers with side arrangement of the anode when charged with magnesium chloride is the anodic solution of the iron anode and deposition of the iron on the cathode, the sponge iron absorbing dispersed magnesium oxide. The experiments described were intended to check this hypothesis. Radioactive iron, Fe^{59}, was arranged in the anode contact. Samples of sludge, electrolyte, floated magnesium, and cathode film were tested with a counter after suitable purification. Results obtained are tabulated as are data showing the effect of solubility of different zones of the anode contact on the yield with respect to current. The yield and the radioactivity of the sludge are plotted on a common time axis. The results showed that anode-contact iron is indeed deposited on the cathode and confirmed the hypotheses and the special influence on passivation of solution of the upper zone of the anode contact. (TCO)

Uranium and Uranium Compounds

7631 ANL-5475
Argonne National Lab., Lemont, Ill.
THERMIONIC PROPERTIES OF URANIUM WIRE. E. G.

Rauh and R. J. Thorn. Aug. 18, 1955. 6p. Contract W-31-109-eng-38. $0.15(OTS).

Three independent measurements of the work function of uranium have been reported. The values obtained were 4.32, 3.63, and 3.27 ev. Since some of these measurements were made with uranium wire and since, as shown by the authors, uranium is very readily oxidized at pressures of 10^{-7} mm Hg to give a relatively non-volatile oxide, one surmises that some of these determinations were subject to error because of vacuum conditions. Attempting to investigate the validity of this criticism, the authors have measured the thermionic properties of a uranium wire in such a manner that some information regarding the cleanliness of the surface can be deduced. The two types of measurements accomplished were the change in the thermionic constants of the Richardson equation with time of heating in hydrogen, and the dependence of current on the retarding potential. (auth)

7632 CF-58-3-38

Oak Ridge National Lab., Tenn.

A SEARCH FOR COULOMB FISSION OF U^{238} BY 28-MEV NITROGEN IONS. W. H. Jones and A. Zucker. [Mar. 1958]. 5p. Contract [W-7405-eng-26]. $0.50(OTS).

A search was made for the fission of the U^{238} nucleus by a Coulomb excitation process induced by 28-Mev nitrogen ions. Photofission of uranium is well known and has a threshold around 6 Mev. The transfer of such large amounts of energy by Coulomb excitation to the uranium nucleus is very unlikely and would, by a classical Coulomb excitation process, not result in measurable yields for the experimental conditions here encountered. The possibility exists, however, that some process such as polarization of nuclear matter might lower the photofission threshold for uranium and that nitrogen-induced fission might be observed. (auth)

7633

GROWTH OF THICK PERFECT α URANIUM CRYSTALS BY COLD FORGING AND ANNEALING POLYGONAL SINGLE CRYSTALS OBTAINED BY PHASE CHANGING. Jean Mercier, Daniel Calais, and Paul Lacombe. Compt. rend. 246, 110-13(1958) Jan. 6.

Strain-cold forging of imperfect α uranium crystals obtained by $\beta \rightarrow \alpha$ phase change permits the production of thick perfect crystals by recrystallization. Comparisons of strain deformations in polycrystals and monocrystals explain the failure of the critical cold forging method applied to polycrystals. (tr-auth)

7634

STUDY OF THE KIRKENDALL EFFECT AND DETERMINATION OF CHEMICAL AND INTRINSIC DIFFUSION COEFFICIENTS IN U-Mo COUPLE. Yves Adda and Jean Philibert. Compt. rend. 246, 113-16(1958) Jan. 6.

7635

THE USE OF NUCLEAR EMULSIONS IN STUDYING THE RADIOACTIVITY OF ROCKS. René Coppens. Ind. Atom. 2, 43-51(1958). (In French)

7636

MEASUREMENT OF THE AVERAGE NUMBER OF NEUTRONS EMITTED BY FISSION INDUCED IN U^{238} BY 14.2 Mev NEUTRONS. S. Blaise, M. Gaudin, R. Joly, J. Leroy, and G. Vendryes (C. E. N., Saclay, and C. E. N. F. A. R., France). J. phys. radium 19, 66-7(1958) Jan. (In French)

The value of the ratio ν/ν' between the mean number of neutrons ν emitted by fission of U^{238} with 14.2 Mev neutrons and the number of neutrons ν' emitted by fission of U^{235} with thermal neutrons was measured. (tr-auth)

7637

STUDY OF THE VARIATION WITH INCIDENT NEUTRON ENERGY OF THE RELATIVE PROBABILITY OF TERNARY FISSION WITH EMISSION OF A LONG RANGE α PARTICLE. J. M. Auclair. J. phys. radium 19, 68-9(1958) Jan. (In French)

For U^{235}, a possible variation with energy of neutrons inducing fission of the long range α particle ternary fission probability was sought. Within the statistical accuracy, no variation was observed. (tr-auth)

7638

OPTICAL PROPERTIES OF UF_6. I. ABSORPTION SPECTRA IN THE VISIBLE AND NEAR ULTRAVIOLET REGIONS. G. D. Sheremet'yev (Physics Inst., Academy of Sciences, USSR and Chelyabinsk Pedagogical Inst., USSR). Optika i Spektroskopiya 1, No. 2, 181-9(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, abstract No. 7818)

An investigation is made of the electron-oscillation spectrum of vapor-like UF_6 at a vapor tension of 5 to 94 mm mercury, and a comparison is made of this spectrum with spectra of solid UF_6 at various temperatures. A procedure is developed for purifying UF_6 of volatile impurities, making it possible to obtain transparent crystals. The maxima of the absorption bands were determined with an accuracy to 15 cm^{-1}. A wide absorption band, beginning at 3341 A and continuing towards shorter waves, and a band in the interval between 4070 to 3470 A consisting of several wide and a large number of narrow bands, were observed. The maximum absorption was found near 27134 cm^{-1}, and a strong one at 26631, 26918, 27548, 27824, 28184, and 28409 cm^{-1}. Films of solid UF_6 also absorb, starting with 3341 A and in the region 4070 to 3470 A. At 88°K one observes approximately 16 narrow bands. The strong absorption in this case takes place near 27134 cm^{-1}, and at room temperature near 26918 cm^{-1}. On the whole, the absorption spectrum of solid UF_6 is similar to the spectrum of the vapor, but is shifted towards the shorter waves by approximately 115 cm^{-1}. Molten UF_6 has a solid absorption spectrum with a sharp long-wave boundary near 4210 A. It is concluded that the electron-oscillating energy levels of the UF_6 molecule have a washed-out character, which changes little as the temperature drops from room temperature to 88°K, and also that the UF_6 crystals are molecular crystals. It is proposed that the structure of UF_6 molecule does not correspond fully to the model of the regular octahedron. (tr-auth)

7639

PROBLEMS ON PHYSICAL METALLURGY OF URANIUM. Carlo Fizzotti. pp. 413-24 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In Italian)

The physical properties of uranium are discussed in relation to the problems of fabricating the metal. The effects of mechanical and thermal treatment on the properties are described. (J.S.R.)

7640

IMPROVEMENT OF NUCLEAR FUELS BY ADDITION OF ALLOYING ELEMENTS. Gérard Cabane. pp. 425-38 in "Proceeding of the Scientific Congress, Nuclear Sessions, July 2-6, 1956, 3rd. Electronic-Nuclear International Review." Rome, National Committee for Nuclear Research, 1956. 447p. (In French)

The criteria determining the choice of uranium alloys to use in a specific reactor are defined. Then the alloys stabilized in the α phase and those stabilized in the γ phase are discussed. Much of the data on alloys is either incomplete or in disagreement with previous results. The need for more stringent research is stressed. (J.S.R.)